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TELEPHONE ENGINEER

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Volume XXI *JUNE, 1919* *Number 6*

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3-bar, 1,600 ohms, compact	8.00
5-bar, 1,600 ohms, compact	9.00
SWEDISH-AMERICAN	
5-bar, 1,600 ohms, compact	8.50
WESTERN ELECTRIC	
3-bar, 1,000 ohms, compact	9.50
5-bar, 1,600 ohms, compact	10.50
KELLOGG	
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3-bar, 1,000 ohms, compact	9.50
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Ten per cent discount allowed on above telephones for cash with order.

SKINDERVIKEN TRANSMITTER BUTTONS

are selling rapidly. Do not put off trying them. It is well worth your while to send for some now! Buttons list at $1.00 each.

Lowest prices on guaranteed ringers, generators, induction coils, repeating coils, cords, switchboards, signal sets, transmitters, receivers, etc. Common Battery Telephones, all makes and types.

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If Your News Dealer Will Not Supply You—Please Notify Us

VOL. XXI CHICAGO, JUNE, 1919 NO. 6

The Good Will of the State Authorities

MANY telephone companies which had been, apparently, constitutionally unable to raise their own rates, will look back at the brief period of government control with a feeling of gratitude. Whatever else it did or did not, the post office department at least took the bull by the horns in the matter of rate adjustments.

Knowing as we do how necessary such adjustments were, it is deplorable that, in making them, the ill will of any state regulatory agencies should have been incurred. And there is, we fear, no question that a formidable number of state utility commissioners now look upon telephone rate problems in no amiable frame of mind. At least one commission has already announced its intention to undertake sweeping revisions the moment the companies are actually out of federal hands. There is likely to be a tendency to regard the new rates as peculiar to the period of government operation, and to be terminated with it.

Despite their general reluctance to apply for increases, telephone men must admit that the majority of state commissions were not unfriendly, not at all disposed to deny reasonable requests. Their only demand was that applications should present all the information in the case, and that the commissioners should have time for analysis before rendering a decision.

The post office department has ordered its rates into immediate effect without consulting the states, and the telephone men, as employes, have had no recourse but to obey. Where schedules were filed with the state commissions, they were introduced not as requests for permission, but as acts that were about to be committed, permission or not. State resentment was the inevitable result, and the litigation that follows resentment has swept through the courts from the lowest to the highest. Though rates have been raised, the net result has probably been less satisfactory than if the usual permission had been asked, and awaited.

To regain the good will of the state authorities may now be the telephone men's greatest, and hardest, problem. It is well enough to say that the justice of the new rates, and still higher ones, may readily be demonstrated; there still rests a tremendous advantage in a favorably disposed umpire. No open sesame to such a condition presents itself to mind at once, though some of the industry's diplomats may be able to figure one out. But obviously it behooves every telephone company to have ready a complete analysis of its condition, so that no obscurity may surround the mathematical side of the question; they should be able to prove the necessity of new rates.

Industry's Gain from the Ingenuities of War

NOT the least of the portion of permanent good that will come out of the great evil of war is the forced development of technical improvements and ingenious applications of science. Industry is about to benefit by the inventions designed for military use; and the telephone has not been neglected in the general speeding up of the inventive faculty.

Wireless telephony, particularly, has made great strides in application and availability, if not in scope. The Craft and Colpitts paper of the American Institute of Electrical Engineers, now running serially in TELEPHONE ENGINEER, reveals the methods by which this strange branch of the telephone art was intensively developed to meet extraordinary demands, and the world now benefits by the result.

Of great interest and importance to many peacetime pursuits is the "noise-proof" transmitter described in the opening story of this issue. This device, also, served in the war and won its spurs. Absurdly simple in principle, it classes among the "Why didn't someone think of that before" inventions, and carries evidence of its practicality on its face.

Exhibits of the manufacturers at the convention are bound to show many indications of the same accelerated development, and should be one of the strongest attractions of the event.

For the Telephone Employes

IF THERE is any one feature of better rates that is brighter than the rest, it is the opportunity they give for remunerating the telephone employes. The men we have in mind take efficient charge of all the engineering details peculiar to this business of infinite detail. Engineering brains, as some one once said, have long been the cheapest commodity on the labor market; and telephone engineering talent has not had the honor of topping even that lowly list. It is time that the devoted telephone worker, the man who knows no hours and who incarnates the spirit of service, got better pay. In higher rates, which means better pay for his employer, the company, there is a chance that he will get his.

Rate Increases Win in Supreme Court!

Highest Tribunal Decides for Telephone Administration

INTRASTATE rates established by the federal administration over railroad, telegraph and telephone lines were upheld June 2 by the Supreme Court at Washington.

The court reversed all rulings of federal and state courts denying the legality of federal administrative action. Among the cases involved was that affecting telegraph and telephone rates in Illinois. Judge Landis recently enjoined Postmaster-General Burleson from collecting the charges he had fixed for service on these lines.

In the wire case, which came before the court apart from that affecting railroad tariffs, the court held unanimously that the joint resolution under authority of which the government took control of the lines gave it power to interfere in intrastate rates. The federal court decree issued by Judge Landis permanently restraining the postmaster-general from charging the increased telegraph rates in Illinois was dissolved.

The Illinois proceedings were originally instituted by Postmaster-General Burleson, who sought to restrain state authorities from interfering with the enforcement of his order increasing telegraph toll rates. A temporary injunction was granted, but when the case came up on its merits, Judge Landis dissolved the injunction and instead enjoined the postmaster-general from placing his order in effect. To permit an appeal, Judge Landis granted an order continuing for ten days the temporary injunction originally awarded Mr. Burleson and withheld enforcement of his own injunction during that time, but upon the government's motion the Supreme Court extended this order so as to permit the postal authorities to continue to collect the higher rates pending final determination of this case. Justice Brandeis gave the only dissenting opinion.

"That under its war power," Chief Justice White said, "congress possessed the right to confer on the president the authority which it gave him, we think needs nothing here but statement, as we have disposed of that subject in the North Dakota railroad rate case. And the completeness of the war power under which the authority was exerted suffices, we think, to dispose of the many other contentions urged as to the want of power in congress to confer upon the president the authority which it gave him.

"The proposition that the president in exercising the power exceeded the authority given him is based upon two considerations. First, because there was nothing in the conditions at the time the power was exercised which justified the calling into play of the authority; as this contention at best concerns not a want of power, but a mere excess or abuse of discretion in exerting a power given, it is clear that it involves considerations which are beyond the reach of judicial power. The judicial may not invade the legislative or executive departments so as to correct alleged mistakes or wrongs arising from asserted abuse of discretion.

"The second contention amounts to only an asserted limitation on the power granted based upon a plain misconception of the terms of the resolution of congress by which the power was given. We are of opinion that authority was conferred as to all the enumerated elements."

Hotels Get Ten-Cent Rate

Under an order signed by Postmaster Burleson, hotels are now allowed to make a charge of 10 cents for each telephone call from rooms or private apartments, and are also allowed to maintain booths in the lobbies or other convenient place for the public, for a charge of 5 cents per telephone call.

The privileges are restored to hotels through the active work of the hotel associations of the country.

"A great many people abuse phone privileges at hotels by casually dropping in and making a call which saves them perhaps far more than the cost of the phone message," according to a hotel man, "and again they will make a long talk over a phone for the simple fee of 5 cents. All the time required for their conversation is depriving the switch board of certain connections, and the result is that some other person is deprived of getting or placing a call.

"The hotel men believe that any call from a room is worth 10 cents, and that calls from the lobby which must necessarily be shorter talks than from a room, are well worth 5 cents."

Minneapolis Employes Are Raised

More than 2,100 employes of the Northwestern Telephone Company in Minneapolis receive increases in wages, effective May 1, as a result of a general increase granted the company, according to L. H. Merrill, district commercial manager at Minneapolis.

The announcement of the increases was made in a telegram received by local officials from W. B. T. Belt, vice president and general manager of the company. Officials of the company issued the following statement:

"Mr. Belt has been in conference in the East with the United States Wire Control board and the postmaster general has approved the increase.

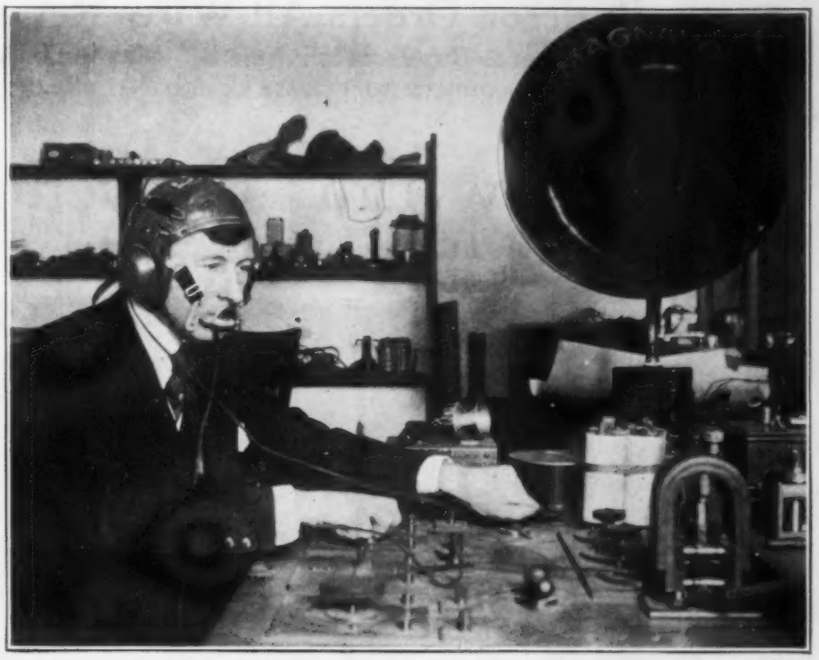
"The authorized wage increase will amount to something over $600,000 per year for the Northwestern company's employes in Minnesota.

"The officials of the Northwestern Telephone Exchange Company have continuously tried to obtain approval from the government operating board for increased wages for their employes, but have not been able to do so because the revenue from the operation of the property at existing rates has not been adequate to permit of the added expense."

Central Indiana Owners Meet

The quarterly convention of the Central Indiana Independent Telephone Owners' Association was held in the city hall at Martinsville, April 22. A school for operators was held in connection with the convention. Dinner was served to the visitors at noon in the Christian church dining room by the young women of the Art Society. The next meeting will be held in Rushville. J. A. Browne is president of the association.

The airplane set fits into the leather helmet worn by all flyers and the mouthpiece is held securely in place by means of straps so that in listening and speaking it is not necessary to use the hands.



Peter L. Jensen, co-inventor of the Magnavox, testing the earliest form of anti-noise transmitter for aviators in the Magnavox laboratories in San Francisco. The early type was entirely open, with no casing whatever.

So strict was the government suzerainty during the war that for a whole year after Pridham and Jensen had perfected their invention no patent was issued and not a word of the discovery crept into any newspaper, magazine or trade journal.

At the top is Lieut. H. E. Metcalf, U. S. Air Service, wearing the Magnavox head set with which he spoke President Wilson's message to 60,000 people from 3,000 feet in the air. The lower picture shows Edwin S. Pridham, co-inventor of the Magnavox, demonstrating it a few moments before Admiral Sims used it to speak to 60,000 people at Washington, with the aid of Audions.—Copyright by International Film Service Co.

Inventor E. S. Pridham demonstrating the anti-noise desk set, showing the two receivers, the perforated transmitter case and the switch-hook stand. A full description of the new telephone, with other illustrations, will be found on page 215.

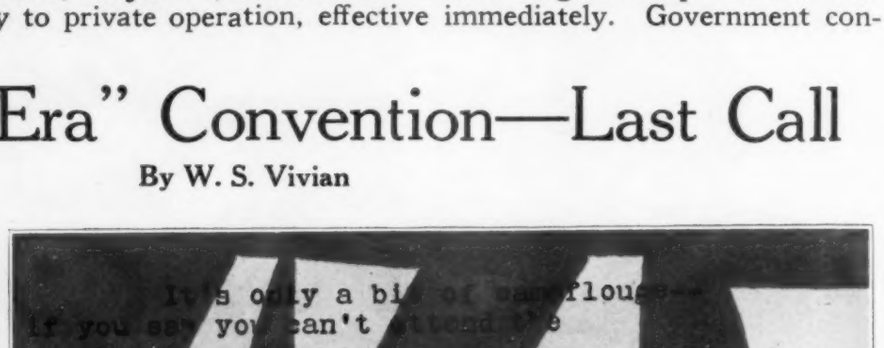
Nearly two years ago the Magnavox apparatus was perfected. The government took almost the entire product of the San Francisco plant, which operated a force of 150 mechanics day and night. Ten thousand transimtters were supplied to the United States government, 100 sets to the French government and many were shipped on orders of this government to the Canadian Aircraft Company in Ottawa, for use in British planes. German fliers received instructions to bring down intact a Yankee plane equipped with the mysterious telephone, and the anti-aircraft batteries of the bache received similar instructions. It may be taken for granted that they made the effort, but they did not succeed in bringing down one plane so equipped.

Burleson Orders All Wires Returned At Once.

Postmaster-General Burleson, on June 5, issued an order returning the telephone and telegraph systems of the country to private operation, effective immediately. Government control is retained.

The "New Era" Convention—Last Call

By W. S. Vivian


NEW ERA CONVENTION of the
UNITED STATES INDEPENDENT TELEPHONE ASSOCIATION
Don't deceive yourself by thinking you can
keep up with the times without seeing the
dealers at the convention.
We'll look for you there!
Hotel La Salle, Chicago, June 24-25-26, 1919

I EXPECT June 24, 25 and 26, 1919, will be history making days for the members and friends of the United States Independent Telephone Association.

The wire industry is facing a serious crisis. For several years costs of labor, material and capital have greatly increased without a corresponding increase in revenues. During the past year these matters have reached proportions, especially with the larger operating companies, which are serious. The postmaster-general, under the war powers delegated to him, has attempted to relieve the situation by authorizing increases in rates, both local and long distance. Insofar as such authorized increases affected intra-state business they were challenged by the state public utilities commissions of several states, and injunctions were issued restraining the postmaster general and his agent from putting such rates into effect. The question of jurisdiction has just been decided, however, by the Supreme Court of the United States. The decision gives full rate-making power to the postmaster general.

Several bills are before Congress with reference to the immediate return of the wire companies to their owners. The manner in which these companies will be returned is also of great interest to every company, and particularly the larger operating companies.

During the last session of a number of our state legislatures there has been a movement which has attained serious proportions on the part of advocates of home rule, whose aim it is to take the rate making powers away from the utilities commissions and place it with the common council of the municipality. Every company located within a state where the public utility commission has jurisdiction is vitally interested in the outcome of this issue.

Therefore the decision of the Supreme Court, the manner in which our properties will be returned, and Home Rule are problems which must be taken up and an attempt made to solve them in such manner as will most fully protect the owners and the public.

In addition to the problems suggested in the foregoing there are many other very important questions which should be considered: What is to be the future of the association? Is it performing work along lines which will produce the greatest possible benefit to its members? Should there be more aggressive work on the part of its committees along the lines of standardization, plant, traffic, accounting and publicity?

On the program there will appear a number of important speakers. Our president, George W. Robinson, who is also president of the Tri-State Telephone & Telegraph Company of St. Paul, Minnesota; Vice-President F. B. MacKinnon, in charge of our Washington office, who has taken a leading part in matters before Congress and also the department of the postmaster general, and Judge F. C. Stevens, special counsel for our association at Washington, a gentleman who was a member of Congress for more than twenty years and who was a member of the Interstate Commerce Commission for a large part of that time, will undoubtedly relate many interesting phases of their work at Washington during the past year—matters which have not been published up to the present time and which are known only to those who have been very close to the work which has been accomplished. We expect a leading publicity man in utility work to appear on our program on that subject. We also expect one of the foremost utility men of the country to appear and discuss the situation of our public utilities today.

On Tuesday, the first day of the convention, the presidents and secretaries of all of the state associations will have a luncheon and business conference to discuss their state problem and how they can better co-operate with each other. They may have some interesting matters to bring to the attention of the convention before adjournment.

On Wednesday, the second day of the convention, there will be special entertainment for all of the ladies attending.

The seventeenth floor will be occupied by manufacturers and supply dealers who will exhibit the latest

(Continued on page 246.)

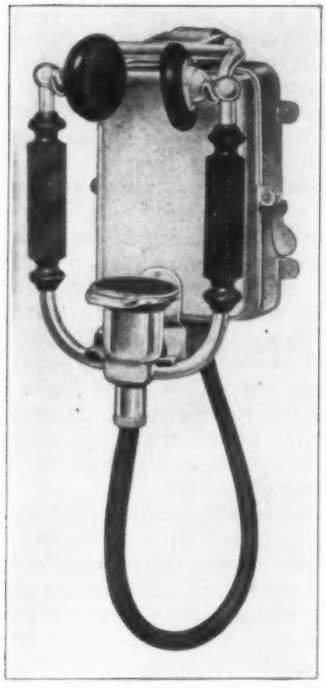
A Successful Noise-Proof Transmitter

Loudest of Extraneous Sounds Have No Effect on the "Magnavox"

WITH the enormous use of the airplane as a fighting and observation unit during the European war, there developed new reasons why rapid and efficient means of intercommunication were necessary—both between the pilot and the bombers or observers aboard the same craft, and also from airship to ground and the reverse (in the latter case, of course, by means of wireless telephony).

To those who have been in the vicinity of unmuffled gasoline or other internal-combustion engines under test, it is superfluous to say that the noise they emit precludes any sort of conversation nearby—except, of course, by some means such as sign language. With the twelve cylinders of a Liberty airplane motor exhausting directly into the air alongside the fuselage of an airplane (or, in the case of a twin-motor plane, twenty-four cylinders), the problem of providing easy communication among the crew of that plane seemed, at first glance, impossible of solution. The tendency of a telephone transmitter of any type previously developed to pick up every noise in its vicinity, as well as the vibrations of the voice directed against it, is only too well known to those who have attempted to use the telephone in any noisy locality. This evil is known as "side-tone," and the best brains of the telephone engineering profession had been combating it for years.

Since the days of its earliest development, the telephone has been tried out at various times for communication from bridge to engine room and between other parts of power-propelled vessels. That it has been found conspicuously wanting in these trials is apparent from the fact that communication from bridge to engine room, and vice versa, is still chiefly effected by means of such mechanical and electro-mechanical devices as the ship's telegraph, etc., and even by the antediluvian speaking tube.

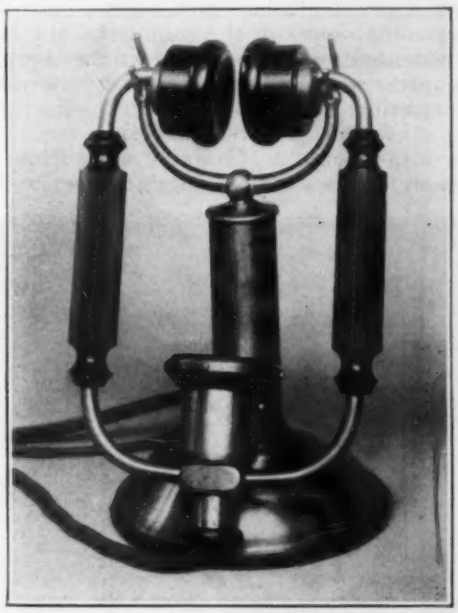


The Magnavox marine telephone installed, with the hand set in place. The transmitter is of the type used on army and navy aeroplanes. The receiver, within the nickel-plated waterproof wall-case, is of the electro-dynamic type, which reproduces with exceptional clearness.

CALIFORNIA ENGINEERS SOLVE PROBLEM

Confronted with such a problem as this, Edwin S. Pridham and Peter L. Jensen, engineers of the Magnavox Company of San Francisco and pioneers in the adaptation to commercial use of the electro-dynamic principle in telephone receivers, took one of the boldest steps ever taken in telephone development, and, by so doing, produced the Magnavox "Anti-Noise" telephone transmitter.

It was this transmitter, invented by these two Californians under war pressure and developed in the laboratories of the Magnavox Company, that enabled virtually perfect telephonic intercommunication among the members of the crews of America's combat airplanes, and equally efficient wireless telephone communication with the ground, from heights as great as ten thousand feet. It was its virtually perfect performance under the severest noise conditions that caused the authorities of the United States Navy to adopt, as the navy standard intercommunicating and wireless telephone system for its seaplanes, the Magnavox Company's equipment.



The Magnavox desk set with its perforated transmitter case and double receiver.

COMMERCIAL POSSIBILITIES

Prior to the cessation of hostilities in November, of course, the veil of secrecy was kept closely drawn over these developments in telephony. Since the signing of the armistice, however, one may disclose to the industrial world and the public what has been conceded by engineers, scientists and commercial men to be one of the most radical developments in speech transmission in the last quarter century; and now the Magnavox Company with vast peace-time commercial possibilities before its "anti-noise" telephone apparatus, has placed on the market various commercial adaptations of its new telephone developments born of the difficult conditions of war.

How Jensen and Pridham attacked and solved the seemingly impossible problem of overcoming the noise of the exhaust of two thundering, unmuffled Liberty

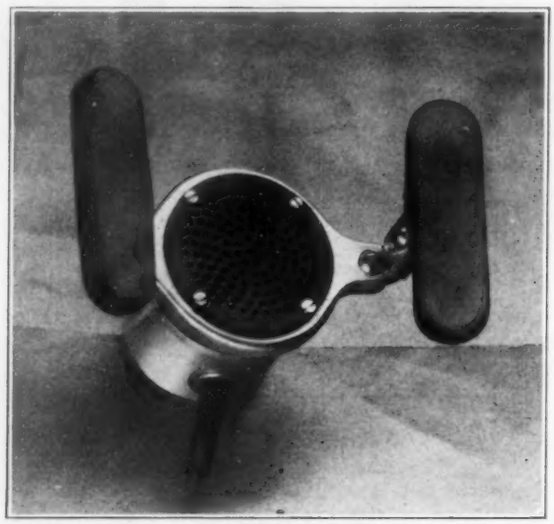
airplane motors and enabling the use of telephones only a few feet from them (both for intercommunication among the crew of the plane and for wireless telephone communication with the ground), is interesting in that the step they took was daring indeed.

Every previous attempt made by telephone engineers—many of them world-famous — to overcome outside noise influence or "side-tone" in the telephone transmitter had been by trying to exclude noise with "sound-proof" cases, padding and the like.

Pridham and Jensen boldly opened the diaphragm and button of the transmitter and let all the noise in—impartially to both sides of the diaphragm. The result was entire seclusion from the circuit of every sound save the voices of the users; and the inventors at once patented the method, the extreme simplicity of which impresses itself forcibly on everyone who hears a demonstration.

NOISE STRIKES BOTH SIDES

The idea is simple. Conceive a big Chinese gong or tom-tom, struck on both sides at once, in the same



This is all there is to the Magnavox Anti-Noise Transmitter as applied to war aeroplane sets during the war. Take away the brackets and the aluminum case and the whole thing would go into the case of a watch.

spot by hammers of equal weight. The blows being equal, the gong will not vibrate. But if a light tap be administered on one side only, at the same time, with a smaller hammer, the gong will vibrate in proportion to the tap of the little hammer. In the case of the transmitter, the outside noise (affecting both sides of the diaphragm equally) is analogous to the two hammers; the voice waves to the smaller hammer.

All of this brings us back to the question of telephone intercommunication between the bridge of a steamship or motorship and the noisy parts of the ship —main engine room aft, boiler room, wireless room, etc. Demonstrations of the performance of the Magnavox "anti-noise" telephone under severe and actual service conditions convinced the representatives of the Emergency Fleet Corporation that it was the long-desired means of unimpeded telephonic intercommunication amid the perpetual din in the vitals of a power-driven ship. As a result, merchant ships now under construction in Pacific Coast shipyards are being equipped with Magnavox "anti-noise" marine telephones.

These marine telephones embody not only the same transmitter that revolutionized intercommunication on board and to and from army and navy airplanes, but also the electro-dynamic type of telephone receiver, which is far superior in speech reception and reproduction to the old type of electro-magnetic receiver employed in the familiar commercial form of telephone.

In addition to embodying these two vital features, the "anti-noise" transmitter and the electro-dynamic receiver, these instruments bear ample evidence of having been carefully and thoughtfully designed to meet all of the unusually severe conditions that must be met by electrical apparatus of any form on board ship. It must be remarked that, unfortunately, owing to the extremely rapid expansion of shipbuilding because of the war, comparatively few electrical manufacturers and contractors as yet have come to a full realization of the rigors that marine service imposes upon all electrical apparatus. As a result much electrical equipment has been installed on shipboard, in the rush of war-time construction — equipment that would have been fully adequate, in strength and endurance, to meet any requirement on shore, but which, under actual service tests aboardship, has failed.

The Magnavox Company, in designing and manufacturing its marine telephones, appears to have taken ample consideration of these differences in working conditions and to have maintained a standard of ruggedness in construction fully up to the severest marine requirements. This has been carried through the manufacture of marine telephones even down to the design of the smallest screw—for the pliers and screwdriver in the overalls pocket of any ship's electrician or engineer are all ever necessary in adjusting or "tightening up."

The use of both ears (the only way to use a telephone and get efficient performance out of it), is permitted by the convenient construction of the nickel-plated hand set. A glance at the photograph will show that this hand set can be used with equal convenience by a right-handed or left-handed person. The tubes which form the side arms of the hand set are hinged at the base of the transmitter mount, and swing outward to permit ready adjustment of the instrument to the ears. A light spring in the base holds the receivers against the ears with the correct pressure, and the ball-and-socket construction at the ear pieces permits the latter to adjust themselves to ears of any shape or slant.

CORRECT MOUTH DISTANCE

It will be noted that, with the hand set in position for speaking and listening, the transmitter is automatically in position for correct mouth distance; nevertheless, an easy sliding adjustment in the base of the transmitter permits its being moved closer to or farther from the mouth, if necessary, or for adjustment to fit facial contours.

The receiving apparatus of the instrument is located in the waterproof nickel-plated wall case, where it is properly protected from salt spray or any other moisture—as also are the switch-hook contacts and binding posts.

A word here about the technicalities of the electro-dynamic type of telephone receiver may not be amiss. In this form of receiver, the vibrating element is a flat coil of wire, and not a soft iron diaphragm as in the old electro-magnetic type. This flat coil of wire is rigidly attached to a bronze diaphragm, in such

a position that it cuts the lines of magnetic force passing between the pole pieces of a permanent magnet. The passage of the fluctuating voice currents through this coil causes it to vibrate in this magnetic field synchronously with the vibrations of the transmitter diaphragm at the other end of the circuit; and, inasmuch as the coil is always at a fixed distance from the pole pieces of the magnet, the reproduction of speech effected by it, through the attached receiver diaphragm, is remarkably clear and faithful to the original. It is not necessary in this article to go into the technical reasons why; however, it may be remarked in this connection that it is this superiority, coupled with certain structural modifications permitting wide amplitude of vibration and greater ruggedness of vibrating parts, that make the so-called "Magnavox," or loud-speaking voice and music amplifier long marketed by this company, the most powerful instrument of its kind.

It will be noted, from a further glance at the photograph of the marine set, that the reproduced speech is carried from the protected receiver within the waterproof case through the flexible tube and via the hand tubes to the ear pieces of the hand set. The hook switch which makes and breaks the talking circuit at any individual station is on the top of the wall case. In restoring the hand set to the hook-switch after use (which automatically breaks the circuit, as in an ordinary wall or desk telephone), a slight push locks the base of the hand set in place beneath the nickel-plated spring clips at the bottom of the case. The telephone is thus prevented from falling when the vessel is rolling or pitching.

The master telephone is located, of course, on the bridge; and other stations may be located in the main engine room, the refrigerating engine room, the chief engineer's room, the steering engine room in the stern, the wireless room, or elsewhere on board as conditions require. In existing installations there are provided waterproof brass junction boxes of special design for each substation. One of these may be readily installed at any point in the circuit, fore or aft, where it may be thought that a future station installation might become necessary.

Current for the telephone service, at six volts, is taken from any three cells of the storage battery located in the wireless room or the vessel; the leads being carried down to a special junction box, directly below, in which is located the necessary induction coil. The use of the storage battery in the wireless room assures the source of telephone current receiving the necessary regular attention and re-charging, and also eliminates all possibility of the old shipboard bugbear —failure of dry-cell batteries.

SHIPYARD USE

The shipbuilder reader probably already has asked himself the question: "If the Magnavox 'anti-noise' transmitter, as adapted to marine telephones for use on board ship, will exclude the noises of engine room and boiler room, then will it not also permit peaceful use of the telephone in the boiler shops of my shipyard, or in the neighborhood of riveting hammers on steel hulls"?

The answer is: "Yes."

With a view to establishing the utility of its "anti-noise" transmitter under just such circumstances, the Magnavox Company has had its apparatus demonstrated under conditions fully as severe as these, and even more severe. One unique test that was made consisted in placing a telephone equipped with the "anti-noise" transmitter inside the steel shell of a boiler. With several men outside the boiler pounding on the shell with hammers, a person inside was able to telephone to those on the outside without interference from the din of the hammering. Judging from this performance, it would appear that the company's equipment will prove somewhat of a blessing to shipyard officials who find frequent use of the telephone to and from noisy parts of their plants a necessity.

THE DESK SET

The places where such an equipment as the newly-developed Magnavox Type B-2 desk set will find application are almost without number. Boiler works, garages, machine shops, piano stores, newspaper offices, offices where typewriters are constantly hammering, offices adjacent to steel buildings under construction—these are but a minor list of places where the "anti-noise" transmitter already has been proven a preventive of telephone noise troubles.

The freedom from inductive disturbances claimed

Magnavox and Four-Button Transmitter as used by Admiral Sims, U. S. Navy, to address 60,000 people from the Treasury Building steps at Washington on Victory Loan Day.

for the set that combines the "anti-noise" transmitter with the Magnavox saturated-field electro-dynamic receiver has brought it to the attention of power line engineers as a relief from the harassing conditions that attend the carrying of telephone lines on the same poles or towers with alternating current power lines, and in all alternating current electric light and power stations.

Persons partly deaf, or even only moderately hard of hearing, have found in the Magnavox "anti-noise" equipment a relief from virtually all of their troubles in the use of the telephone. The ear that is slightly deaf has its great trouble in the separation of the essential sounds of the conversation from the side-tones or extraneous sounds, when the ordinary solid-back telephone transmitter and common form of electro-mag-

netic receiver are used. Such people who have tried the combination of the "anti-noise" transmitter and Magnavox electrodynamic receiver declare that it is indispensable to their free use of the telephone.

While we cannot discuss at length the historic development of the Magnavox it will be of interest to add that it was the outgrowth of the formation of a friendship, nine years ago, between two young inventors, neither of whom then could speak the other's language.

Edwin S. Pridham, Californian, and Stanford graduate electrical engineer, and Peter L. Jensen, formerly associated with one of Denmark's most famous inventors, Dr. Valdemar Poulsen, were thrown together on the engineering staff of the Federal Telegraph Company of San Francisco. Dr. Poulsen, one of the outstanding figures in wireless telegraph development, had sent young Jensen to San Francisco to assist in introducing the Poulsen arc system of wireless telegraphy. It was Jensen and Pridham who erected and put into operation the first station in the United States employing this now widely-used and successful system, of which it is sufficient to say that it is now acknowledged to be the most efficient and practical for long-distance radio-communication, and that it was the system employed by the United States Government for keeping General Pershing's headquarters in France in direct touch with the War Department at Washington.

Late in 1910 and early in 1911 Pridham and Jensen visited Europe together, and conferred with many European wireless telegraph pioneers and experts. On their return in 1911 they interested Richard O'Connor of San Francisco, a retired capitalist, in equipping for them an experimental laboratory for the development of ideas gained abroad. It was in this laboratory, at Napa, while working out the problem of a possible improvement of the telephone receiver—usually considered as one of the most sensitive and simple of all electrical instruments—that they struck out in a new direction in telephony and developed the saturated-field electro-dynamic type of receiver, with a moving coil vibrating across traversing lines of magnetic force. This instrument shortly thereafter was developed into the loud-speaking instrument, given the appropriate name of "Magnavox" (from the Latin, "great voice"). and soon brought to a basis of commercial utility.

It was one of these instruments that, concealed behind a pillar of the new San Francisco city hall, enabled Mayor Rolph to speak to a vast out-door audience of over 75,000 people in the Civic Center, on Christmas Eve, 1915, and be heard by everyone in the throng, as well as by persons in the windows of apartment houses seven blocks away. Sailors on the old battleship "Oregon," anchored off the city in San Francisco Bay, danced on the decks to the music of a phonograph on the Tower of Jewels at the Exposition, projected across the water by the Magnavox. Residents of the city of Napa, during the earliest experimental stages of the instrument, used to ring up the laboratory and request their favorite opera selections.

That such an instrument should have vital commercial value and manifold uses was apparent from the outset; and, with an intervening stage wherein the Commercial Wireless and Development Company (the original corporation formed by Jensen, Pridham and O'Connor), was re-named The Magnavox Company, the latter corporation, retaining its name, was merged with the Sonora Phonograph Company in the wake of the successes of that organization before the Awards Committee of the Panama-Pacific Exposition. It was this merged organization that, continuing the experimental and research work of Pridham and Jensen which had produced such striking developments, gave to the world what in all conservatism has been called, by engineers and scientific men, and by Army and Navy experts of the United States and foreign governments, "one of the most significant developments in telephony during the last quarter of a century"—the Magnavox "anti-noise" transmitter.

Burleson Asks Legislation

Recommendations of the wire control board that legislation returning the telephone and telegraph systems of the country to private ownership provide coördinated operation of the various systems and fixing of rates by the interstate commerce commission were forwarded by Postmaster General Burleson to the house postoffice committee.

The wire board's recommendations also include creation of a tribunal to hear all controversies between employers and employes and that changes in wage schedules shall not become effective until submitted to the interstate commerce committee so that corresponding changes may be made in rates.

Mere return of the wires to their owners will not solve problems confronting the companies, Mr. Burleson said. Extraordinary costs of operation and maintenance "fastened upon them as a result of war," the postmaster general said, "will continue for some time.

"Coördinated operation does not require monopoly of ownership, but is necessary so there can be a consistent and harmonious regulatory policy. Through this means only can the attempts at wasteful competition and the economic loss occasioned by duplications of plant and force be avoided.

"It is believed that this is desirable and can be reached by amending the law so as to provide, subject to the approval of the interstate commerce commission, that any telegraph and telephone company doing an interstate business may purchase the property of any other telegraph or telephone company, or consolidate with any other company, or pool traffic, under provisions which will protect the public.

"Hence, it is believed that the law should be so amended as to empower the interstate commerce commission to fix rates for telegraph and telephone companies subject to provisions of the act, and that a company whose lines are located entirely within a state, but which transacts direct interstate business, should be made subject to the act."

The commission's use of its rate making pow Mr. Burleson said, would insure the companies sufficient revenue to yield a reasonable return on the value of property and also to give proper service.

Grace Banker Gets D. S. M.

Before a crowd of admiring officers and enlisted men, Miss Grace D. Banker of Passaic, N. J., received the distinguished service medal from Lieut. Gen. Hunter Liggett, commander of the First army, at army headquarters. She is chief operator of the army telephone service here and has been overseas a year at general headquarters and with the First army.

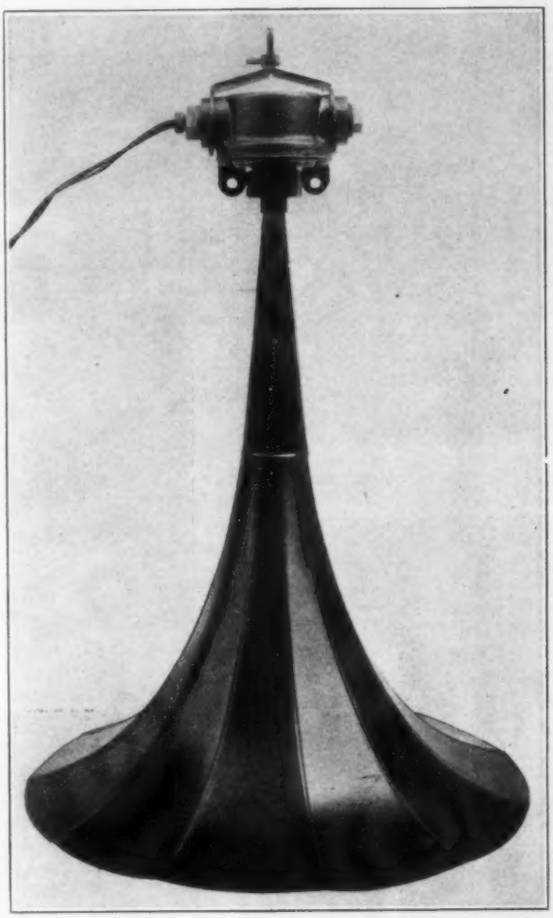
Public Speaking from Airplane by Radio

Extraordinary Achievements of Science Demonstrated During Victory Loan Drive

DURING the three weeks covering the Victory Loan drive the crowds that daily thronged Liberty Way in New York were accorded the unusual sensation of having spoken messages come to them out of the air.

The medium that accomplished this modern miracle was the radio telephone that played a considerable part in the war. It will be recalled that back in 1915 the engineers of the American Telephone & Telegraph Company and the Western Electric Company, in co-operation with the Navy Department, gave a remarkable demonstration, and Secretary Daniels, talking from Washington, D. C., talked to all the naval stations in the country and with the commander of a warship far out at sea. Later one-way communication was established between the station at Arlington, Virginia, and Paris, France, and the Hawaiian Islands.

When the war closed the United States had a highly efficient system of radio telephony, based on these early developments, by which constant communication could be maintained between ground stations and flying airplanes and between airplanes in motion.



Loud-speaking telephone receiver used in public address telephone system.

Having done its bit in winning the war the radio telephone was given the task of inspiring the Victory Way crowds to put their dollars into bonds to help pay for Victory. It performed its task with great success.

On Victory Way the wireless antennae were stretched over the concourse; 112 loud speaking telephone receivers were suspended from these antennae in four rows. In front of the speaker's desk there were three microphone transmitters on iron uprights. This was all the visible evidence of the equipment. But in the Railroad Y. M. C. A. building there was a maze of wires and switches forming the wireless sending and receiving apparatus. From this point the wireless messages passed over the wires to the control room behind the speaker's desk on the east side of the enclosure and were there amplified many million times so that they might be heard by the crowds on the concourse through the medium of the loud speaking receivers.

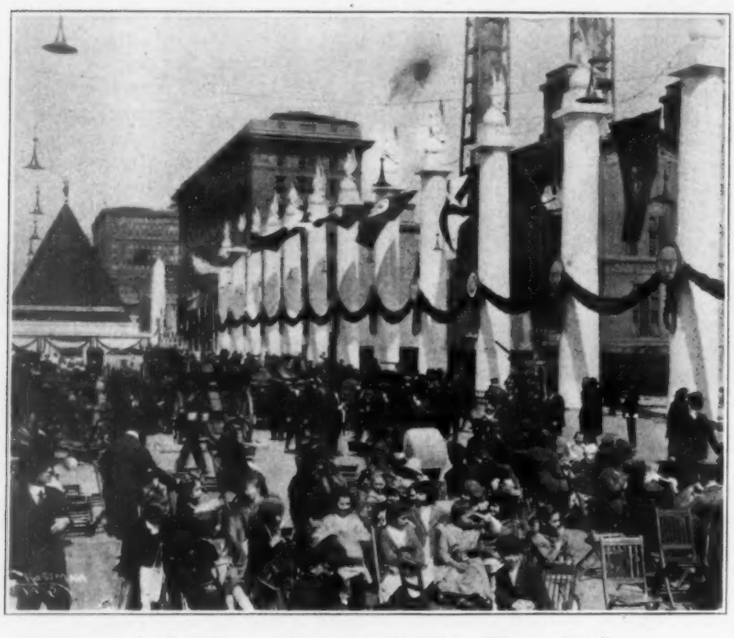
Three high-grade, long distance circuits of the American Telephone and Telegraph Company, each approximately 227 miles long, were wired direct between the office of Frank R. Wilson, director of publicity for the Victory Loan campaign, at the Treasury building in Washington, and the control room on Victory Way. Many noted speakers talked direct from Washington to the great audiences on Victory Way from Mr. Wilson's office. A return circuit made it possible for the speakers at Washington to hear other speeches, music and applause from the audiences in New York. Among those who talked to the crowds on Victory Way were: Mrs. Carter Glass, wife of the secretary of the treasury; Miss Clara D. Noyes, chairman of the Bureau of Nursing Service of the Red Cross; Mrs. Newton D. Baker, wife of the secretary of war; Mrs. Larz Anderson; Franklin D. Roosevelt, assistant secretary of the navy; Major General George Barnett, and Count de Chambrun, of the French embassy at Washington.

Roughly, the operation of the radio telephone was as follows: Radio waves received on the antennae passed to the tuning apparatus in the receiving set, by means of which the desired wave lengths are selected and converted into currents of audible frequencies by the detector tube, after which they are amplified about 1,500 times and conducted to the telephone control, where an additional amplification of from one to five million times is provided. The energy is then delivered to loud speaking receivers.

The transmitting apparatus consists of a high frequency oscillator and means for modulating the high frequency currents in accordance with speech sounds and waves, which were impressed upon the diaphragm of the telephone transmitter by the speaker's voice.

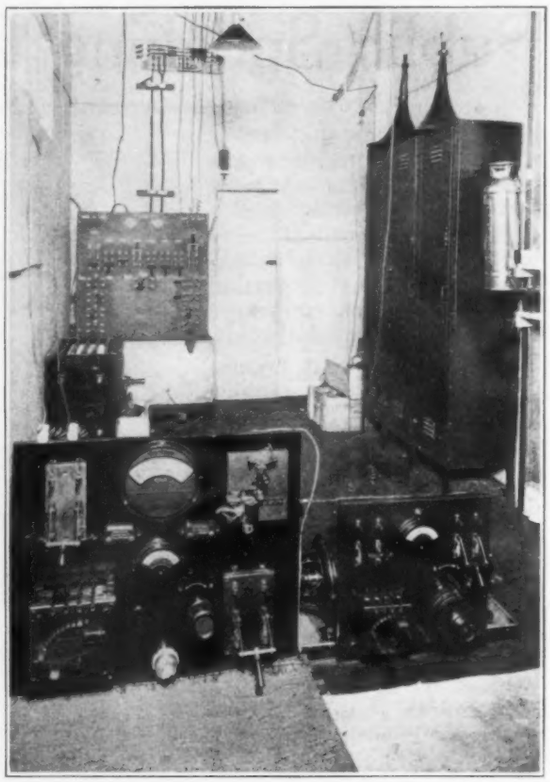
The source of electrical energy for operating the radio telephone equipment was a set of automobile storage batteries used to deliver current to heat the filaments of the vacuum tubes and run the dynamotor delivering energy to the plate circuits of the transmitting tubes. There was also a panel for controlling and distributing the power to the transmitting and receiving sets. Special equipment had to be furnished to magnetically shield the control room in order to eliminate the possibility of disturbances from outside electrical influences.

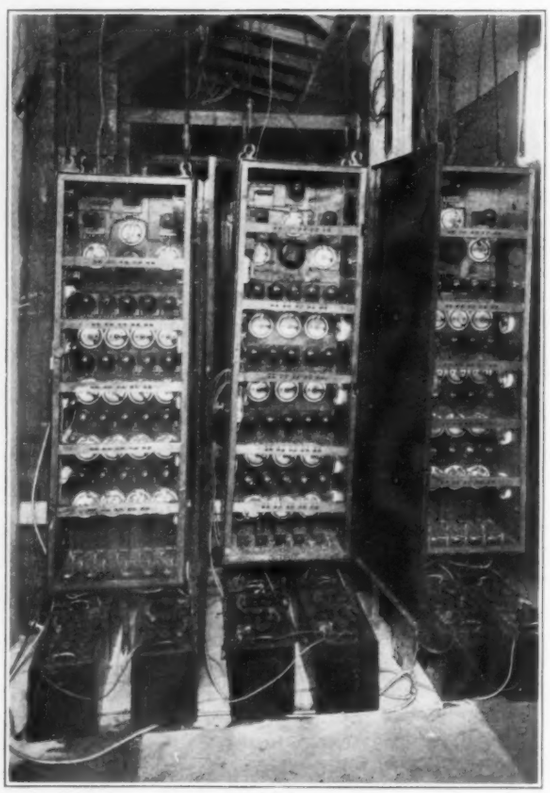
Speaker's rostrum on "Victory Way," with Microphone transmitters.
—Copyright by Underwood & Underwood, N. Y.



Loud-speaking receivers suspended above "Victory-Way."

The telephone control room on "Victory Way."





Above is a general view of the power plant in the telephone control room. Below is a close-up of the amplifier set installed in the same room. Making public speeches to crowds in the street, both by wire and wireless, was a feature of New York City's Victory Loan campaign. (*See page* 219.)

Besides the speakers at Washington, many notables addressed the audiences from the speaker's stand. Among them were: Mrs. Vincent Astor; Mrs. W. G. McAdoo; Miss Ann Morgan; Admiral Mayo; Rear Admiral Plunkett; Rear Admiral Rodman, Brigadier General Cole; Lieutenant-Colonel Hughes and Mr. Martin Vogel.

Without the loud speaking telephone receivers it would not have been possible for all the Victory Way audiences to hear these speakers.

More miraculous, however, were the radio telephone communications both from the Western Electric Company's station on West street and from a navy seaplane flying over New York.

From the land sending station, a five-minute speech was transmitted across the city by wireless telephone, received at the antenna over Victory Way, multiplied and transmitted to the loud speaking receivers, and every word was clearly heard by a crowd of 10,000 people.

Music was transmitted by wireless telephone also very effectively.

The demonstration of the speech from a flying plane a thousand feet above the street, seemed the more difficult because the whirring of the propellers would seem to drive out any other sound. In spite of this handicap which made the hearing of nearby voices difficult, the observer in the seaplane addressed the crowd through his wireless equipment, the radio message being received by the antenna over the concourse and transmitted to the crowd through the loud speaking receivers. Not only could the crowd understand the flier's appeal to "buy bonds," but anyone who knew him could even recognize his voice, and when he announced that he would drop a shower of circulars, the crowd waited expectantly until the promised shower appeared.

The flier did not leave for his headquarters until the officials had assured him by wireless telephone that his message had been received and understood by the assembled multitude.

Vail and Robinson Petition Congress

BY F. B. MACKINNON

Members of congress received, May 19, an appeal from Theodore N. Vail, president of the American Telephone and Telegraph Company, and G. W. Robinson, president of the United States Independent Telephone Association, asking for speedy legislation to enable the return of the telephone properties throughout the country to their private owners. Since last November Mr. Vail has been "personal adviser" to Postmaster-General Burleson in the governmental control of the wire system.

Below is a copy of the letter which has been sent to all of the United States senators and members of the House of Representatives:

Washington, D. C., May 19, 1919.

TO THE MEMBERS OF THE SENATE AND HOUSE OF REPRESENTATIVES:

On midnight July 31, 1918, under the authority of Congress for war purposes, the President took supervision, possession, control, and operation of the telephone systems of the country and has since operated them. The war has practically ceased. The public press is strongly demanding, the general public and the owners of the telephone properties are urging, that they be returned as speedily as possible, that former conditions may be restored and more satisfactory service be afforded. The President and the Postmaster-General have announced that this will be done as soon as adequate arrangements be provided for receiving and advantageously operating them. It remains only for Congress to enact such legislation as speedily as possible.

The expenses of these systems have largely increased during the past year, for wages alone at the rate of more than $20,000,000 per annum. This was inevitable and necessary by reason of larger proportional increases by the railroads and industries of the country. The revenues are inadequate to care for such increases, and the deficit of the government on that account to date is large and steadily increasing. The postmaster-general ordered that steps be taken to secure adequate revenues, but contentions with the regulatory authorities of the states, not yet settled, have prevented such adjustments.

If such conditions continue, necessarily the credit of the operating companies will be impaired, proper expenses cannot be met, the best operating forces cannot be retained, needed extensions and satisfactory service cannot be provided. A deterioration will ensue which in some localities may threaten a recurrence to public ownership or operation in order to care, even inadequately, for public needs. By prompt action Congress can prevent this contingency.

Just and speedy settlements should be made for all properties taken under the existing law, that such balances now in the possession of the government may be restored to assist in the upbuilding and extension of the various systems for better public use. The conditions and regulation of operation should be clearly defined so as to permit the companies to reestablish and maintain a satisfactory service with reasonable rates without discrimination and procure the benefits of legitimate competition. The principal operating companies of the United States are vitally interested in cooperating with Congress and the officials of the government to accomplish these results.

THEO. N. VAIL,
President American Telephone & Telegraph Co.
G. W. ROBINSON,
President U. S. Independent Telephone Assn.

The Executive Committee of the United States Independent Telephone Association has held several meetings to consider the problems now confronting the Independent telephone industry and consulting as to the steps to be taken that will best protect the Independent properties. It was thought advisable, in order properly to inform the public and the members of Congress, that Mr. Robinson should join with Mr. Vail, president of the American Telephone and Telegraph Company, in the issuance of a statement setting forth in brief, concise form the situation of the companies, the desire of the companies that they have their properties returned to them immediately, and that while doing so Congress have in mind the necessity of properly compensating the companies, as provided by the act of Congress under which the telephone properties were taken possession of by the government.

As no award of compensation has been made to practically all of the "B" and "C" Class companies and many of the "A" Class companies, it seems essential that while legislating relative to the return of the properties, Congress should provide for "just compensation" to the companies.

It is generally agreed that the telephone properties when returned to their owners should be returned at midnight on the last day of a month so that all accounts can be closed at the end of the month and financial adjustments between the companies and the government facilitated.

In order to secure as widespread publicity as possible as to the condition of the companies and the necessity of legislation, I would suggest that you arrange immediately with your newspapers (daily or weekly) to publish in full the above letter and secure if possible, editorial comment.

See the "New Era"
Telephone Equipment
at the "New Era"
Convention—

Suite 1708-9-10
Hotel La Salle

PRESENT conditions and future developments make Automatic Telephone Equipment of greater interest and importance to telephone men than ever before.

We are planning a complete exhibit of this apparatus during the National Telephone Convention, at Automatic Headquarters, Rooms 1708, 09 and 10, Hotel La Salle.

You, and every other telephone man attending the Convention, are invited to visit this exhibit.

There you will be able to study Automatic Equipment in operation, observe its application to all the various services your company is called upon to render, question our engineers, and discuss its features with operating men from all parts of the country.

The Automatic System is the "New Era" system—it alone can meet the problems you are facing. There will be very real profit for all who visit and study the Automatic Exhibit.

AUTOMATIC ELECTRIC COMPANY
CHICAGO

The Nerve System of the A. E. F.

U. S. Signal Corps' 126,000 Miles of Wire—from "Stars and Stripes" of April 4

FROM the days of the Greek torch bearer to wireless, the art of signaling has been perfecting itself until in this war its possibilities imposed upon the Signal Corps of the American Army the duty not only of keeping every part of the vast organization between front line trench and Washington in liaison, but of discovering and reporting enemy movements as well.

An army without a signal corps would be like a man without a nervous system. It could not make a single coördinated movement. The great network of wires from company to battalion and from battalion to regimental headquarters, thence on to divisional, army and general headquarters, later interlaced with another great system of lines in the Services of Supply, and finally extending back more than three thousand miles to the commander-in-chief of the army himself, is patterned curiously both in function and action after the nervous system of the human body.

Through this system of nerves the guiding brains of the army received information and the resulting commands were sent out to the centers of action.

TWO SPECIAL FIELDS

The Signal Corps of the A. E. F. was charged with two special fields of action—the construction, operation and maintenance of a general system of communication by telegraph, telephone and radio in the S. O. S., and communication by every practical means within and between fighting units.

The way in which the Signal Corps met these responsibilities can never be measured in dollars and cents, and yet it is interesting to know that a very conservative estimate places the money earning power of that organization as a telephone and telegraph company alone, during the war at $6,650,000, apportioned as follows: Telegrams, 8,685,960, $4,600,000; telephone calls, local, 25,184,500, $1,130,000; telephone calls, long distance, 870,148, $920,000.

The A. E. F. Signal Corps operated 202,500 kilometers (126,000 miles) of lines, of which 62,500 kilometers (39,000 miles) were combat lines maintained under the most dangerous and trying conditions at the front, and only 32,800 kilometers (20,500 miles) were lines leased from the French. Its telephone lines ran through 396 head central offices and 14,854 telephone stations, of which 125 central offices and 3,064 telephone stations were at the front. It had 198 telegraph offices, 64 of which were with the advance armies.

There are times when figures, however large, seem to shrink before bigger things. For example, work of the Radio section of the Signal Corps saved thousands of lives in the St. Mihiel drive. The location of enemy radio stations the night before the attack of September 12 was the determining factor in the decision of the Intelligence Section that the Germans had not withdrawn from the region despite almost overwhelming evidence to the contrary. At the time the sending of the infantry without artillery support was being seriously considered. Thanks to the alertness of our Signal Corps, even the enemy's plans for a counter attack were caught by our intercept stations three hours before it was to have developed.

DESPITE SERIOUS LOSSES

In a letter to the chief signal officer of the A. E. F., dated February 19, 1919, General Pershing said:

"Each army, corps and division has had its full quota of field signal battalions, which, in spite of serious losses in battle, accomplished their work, and it is not too much to say that without their faithful and brilliant efforts and the communications which they installed, operated and maintained, the successes of our armies would not have been achieved."

The Signal Corps was essentially a combat organization, with three-fourths of its troops serving at the front. At the time of the armistice there were 1,000 officers and 27,000 members of its personnel on duty with the armies at the front, and only 462 officers and 6,038 men in the S. O. S.

There should be mentioned in particular as augmenting this personnel 223 American women who came over from the States in six operating units. An army report says: "It is only fair to state that the good service rendered under nerve-racking conditions during the last strenuous months of the war when the big push was on was due in no small part to their ability as operators and their untiring zeal and labor in the service." And some of these "hello girls" got right up into the midst of it, too. A unit under Miss Grace Banker, as chief operator, handled the heavy telephone traffic of the First Army Headquarters during two important operations—and handled it well.

SIGNAL CORPS WITH THE ARMIES

The accomplishments of the Signal Corps in battle and of that part of its personnel serving with the armies constitutes naturally the chapter of its work of which it is most proud. A field signal battalion of 14 officers and 459 men was attached to each army, army corps and division. Two telegraph battalions of ten officers and 212 men each were assigned for duty with each army and one with each corps.

The field signal battalions were composed of a headquarters and supply section, a radio company and a wire and outpost company. The telegraph battalions were provided with motorcycles, trailers and trucks and all implements and materials for constructing and repairing telephones and telegraph lines.

Signal work was, of course, very different for trench and open warfare. In the last days, when the armies swept forward miles at a time, the signal men swept forward with them, stringing their lines as they went, and maintaining communication with the bases principally by telephone. Radio was reverted to only when necessary.

In all our major advances our Signal Corps successfully maintained our lines, and an idea can be had of what this meant from the estimate of the French Army that it took 1,000 kilometers of wire of all types for each kilometer of front consolidated after an advance of ten kilometers.

It was estimated by our own Signal Corps that an army of three corps advancing under average conditions should have a minimum automatic daily supply of 2,500 miles of wire of all types, 500 pounds of tape, 800 dry batteries, an abundant supply of telephones, switchboards, telegraph instruments, radio equipment,

and quantities of special and technical supplies, in addition to the regular reserve to be carried.

In trench warfare, also, telephone and telegraph lines were principally used, the wires being laid underground in the regions near the front lines. The use of the telephone by our combat forces was so extensive that all other means of communication might be classed as auxiliary and emergency. By means of the "buzzerphone" telegraphic messages could be sent over the lines with practically no danger of interception by the enemy. Between company headquarters in the trench and battalion headquarters, underground telegraphy, or T. P. S., as the French called it, was used to supplement telephone communication. Then for the same purpose between battalion and regimental headquarters, trench radio was employed.

SOMETIMES AHEAD OF INFANTRY

The most interest and spectacular modes of signaling in combat were employed only in emergencies. Generally, if the lines wer cut, the Very pistol with its star shell cartridges or the 15-centimeter French projector could be used. Many times pigeons supplied the only means of communication, as in the case of the Lost Battalion in the Argonne. Runners, of course, played a large part in the relaying of messages after the fighting became continuously open last summer.

The Signal Corps men at the front, both in stationary trench warfare and in the open advances, did their work in the face of the same dangers and hardships that faced the doughboy, suffered heavily in losses, and gained richly in thrilling experiences worth while remembering. They went over the top with their comrades and oftentimes had to go ahead of the infantry.

When the town of Vaux was captured June 30, 1918, because of a turning movement, a Signal Corps detachment reached the objective before the infantry. A man was sent out to install a telephone. He found a likely looking dugout and went in, telephone in hand. He found nine Germans hurriedly packing up to move. He told them he wanted to put in a telephone They objected and he insisted.

A fight ensued, and the lone American was decidedly underneath, when one of the German soldiers spoke in Polish. Once again the cosmopolitan character of the American Army saved the day. The telephone man was a native-born Pole himself, and in a few minutes he had re-inforcements, with the result that shortly after he emerged from the dugout with a broken telephone and nine prisoners, five of whom were Poles.

COPYING GERMAN MESSAGES

There was one kind of work done by the Signal Corps at the front which for interest and daring vies with anything the records of the war hold. This was the task performed by 12 officers and 402 men of the Radio Section, who maintained six different kinds of stations for keeping tabs on the enemy and policing our own lines to see that the enemy did not keep any tabs on us.

They had intelligence intercept stations which copied messages in code from German ground-radio stations; airplane intercept stations which intercepted messages between enemy planes and ground stations; airplane goniometric stations which located enemy observation plane; control stations which supervised and policed the work of the American radio stations; goniometric stations which got bearings on enemy radio stations; and last but not least the listening stations which copied telephone and T. P. S. messages of the enemy.

The story of how the Germans devised a new code for use at the front and of how the Allies got on to it before the Germans themselves, illustrates the finesse of our Signal Corps in this kind of work. The new code was supposed to have gone into effect March 11, 1918. On March 13 an American intelligence intercept station caught a message from a German station which had just received a message in the new code, asking that the message be repeated in the old.

From the call letters given in the message it was possible to find both original message in the new code and the repetition in the old. This assured the solution of the new code before the Germans themselves were familiar with it.

CHANGING CODES AT INSTANT'S NOTICE

As a contrast, and as a curious commentary on the much-talked-of German efficiency and American unpreparedness, when a code book was stolen from us by the Germans, not only was another code ready but our operators were actually prepared to use it when the order went out to put it in immediate effect.

There is no more thrilling page in the romance of the war than the little history of the American listening stations of the Signal Corps. They were always to the front and sometimes in No-Man's Land itself, but wherever they might chance to be located, they were, as one of the men described them, "very near Heaven." Their business was eavesdropping, and if they didn't hear any good of themselves, they managed to do the doughboys lots of good.

Loops of wire were constructed out in No-Man's Land parallel to the enemy's lines, and the tiny electric currents induced in them were magnified by means of an amplifier. Copper mesh mats or metallic rods were buried as near the enemy wires as possible and from them wires led to the amplifier. By this means ground currents and leaks from the enemy wires were magnified to audibility.

The planting of these "grounds" near the enemy's lines called out some of the most heroic instances of personal bravery and resourcefulness at the front. Time after time these men were caught by the spotlight of a star shell as they crawled out in the night toward the German lines and were seen no more. Often they were caught between a double barrage probably started by their own sentry. More often, however, they wiggled their way through barbed wire and shell holes, planted their wires, and returned to reap the benefit of their daring.

PHOTOGRAPHIC SERVICE WORK

There were many special services of the Signal Corps charged with important and interesting work. For many years to come thousands of pictures of battle scenes and A. E. F. projects will never be looked at without a little reminder at the foot of them that they were the work of the Signal Corps. The Photographic Service in the 11 months previous to the Armistice exposed in the field and developed 388,149 feet of actual war moving picture film. and at the same time exposed 24,273 still negatives from which 163,213 prints were made.

The Meteorological Section furnished data to the Artillery, Air Service, Chemical Warfare Service and Sound Ranging units as to the direction and speed of the winds and probabilities regarding rain, fog, clouds, etc.

The Army Pigeon Company rendered valuable aid

in providing communication, especially with tanks and isolated units, when all other means had failed.

The Research and Inspection Division maintained at Paris a laboratory for the development of apparatus to meet signaling requirements, tested out all new apparatus and inspected all signal supplies. Among the new devices credited to this division might be named a tank radio set, the two-way radio loop set for communication between advanced units, the American listening station equipment, the two-way T. P. S. set, mobile telephone and telegraph offices, a gun-sight listening device; radio tractors and trailers and gonio tractors.

An engineering Section planned all Signal Corps installation. Finally, there was a section charged with the preparation of our codes.

LARGEST MILITARY TELEPHONE AND TELEGRAPH

The Signal Corps in the S. O. S. stood staunchly behind its front-line work. It not only made it possible for any American unit in the S. O. S. to get in touch with any other, but supplied all the missing links between the S. O. S. and the actual advance areas. It operated at Tours the largest military telephone and telegraph office in the world and two others nearly as large at Paris and Chaumont. The Tours office did more business than any commercial office in France except one in Paris alone.

In the fall of 1917 the increasing importance of A. E. F. activities in England made it necessary to arrange for our own cable across the English Channel. Accordingly, in January, 1918, a four-conductor cable was laid for the Signal Corps between Le Havre and the southern coast of England, which connected directly with London. The Signal Corps established large offices in London and lines were leased to the various camps and ports in England occupied by the A. E. F., such as Winchester, Southampton and Liverpool.

To the credit of the Signal Corps must be given one of the chief accomplishments of the whole Signal Corps during the war—the successful equipment of combat divisions with the special signaling apparatus required in modern warfare. Much of this, especially radio equipment, was new to America and had to be located in sufficient quantity in Europe. Up to the time of the armistice the Signal Corps bought in France $9,500,000 worth of equipment for its combat units, and another $1,500,000 worth of line construction material. Miscellaneous equipment for photography, research, meteorological work, school and repair shops, to the value of $2,500,000, was also purchased in France. Of course, not all of this was paid for in cold cash, but by November 11th the Signal Corps had paid up bills to the amount of $4,500,000.

The Signal Corps maintained seven supply depots and three army parks covering storage of 350,000 square feet and an open storage space of 1,500,000 square feet. More than 100,000 tons of supplies were handled, 62,000 coming from the States, 37,000 from France, and 1,000 from Great Britain.

And the work of the Signal Corps, with the troops and in the S. O. S., like the work of many other branches of the Army, has not ended with the armistice. Indeed, the accomplishments of this department in extending and maintaining communications hundreds of miles into Germany and to Rotterdam and Antwerp, and of keeping the great scattering family of the A. E. F. on speaking terms would make a good story all by itself.

Illinois Utilities Seek Publicity

Public utilities of Illinois—electric, gas, traction, water, and telephone companies—in a combined effort are to place their "after war" case directly in the hands of the persons to whom they are responsible—their customers.

Adopting as their slogan, "There can be no prosperity in Illinois unless the public utilities are prosperous," the utilities have issued an invitation to the public to "put the spotlight on us." Their composite "case" is to be made known through the Illinois Committee on Public Utility Information, whose organization has just been announced. This committee, with offices in the Bedford building, 203 South Dearborn street, Chicago, is to operate "under the auspices of the Illinois Gas association, Illinois State Electric association, Illinois Electric Railway association, and other public service organizations, and in the interest of their customers, investors, and employes." Bernard J. Mullaney is director.

The purpose of the committee is outlined in a public statement, as follows:

"The committee proposes to do now for the public utilities what the railroads failed to do until they were almost strangled; namely, to put before the people of Illinois, by every possible means, the economic facts of the public utility industry, as an industry. This takes in the small town light plant as well as the big city electric company or street railway system; 'independent' and 'farmer' telephone companies, as well as the Bell interests.

"The gas and electric companies of the state daily serve 1,700,000 customers, and counting five to a family —the usual computation—this means 8,500,000 persons, or practically every person in the state. The street and electric railways carry 2,000,000,000 passengers every year. In the light of these figures, no words are needed to emphasize how closely the lives, happiness, and comfort of every man, woman, and child are linked up with the public utilities. Every person who uses a telephone, rides on a street car, or cooks or reads with gas or electricity is entitled to know the facts concerning these companies.

"Without efficient utilities, cities and towns cannot prosper, and utilities cannot be efficient without prosperity. They must pay their bills, like people who buy from the grocer, and as the grocer must pay his, or they must shut down. Every human precaution has been taken against a monetary panic, while, generally speaking, no practical or considerate thought has been given to the preservation of the service companies without which the industrial, social, and commercial life of the country cannot continue. Labor is vitally concerned, probably more than any other element, because it knows the high wage scales necessitated during the war by high living costs cannot be maintained unless the utilities are given just treatment.

"If the utilities are not to be strangled, the best preventive is public knowledge of the economic facts which go to make them the tremendous factors they are in the state's industrial and economic life. Unless they prosper, there will be no prosperity in Illinois. Just treatment is essential both to the maintenance of good service and to the protection of investors. The undermining of the credit of the utilities cannot fail to have far reaching effects upon general credit and business prosperity, for their credit cannot be placed in jeopardy and the effect localized or even restricted to these companies."

Radio Telephony

Presented at the Convention of the American Institute of Electrical Engineers

BY E. B. CRAFT AND E. H. COLPITTS

THE New York-Arlington-Mare Island Demonstration.—After obtaining successful communication with Darien, a distance of 2,100 miles, attention was directed towards reaching the Pacific Coast stations of Mare Island and San Diego. As a test of the transmission efficiency, records were made at the W. E. Company's laboratory in New York of the quality and intensity of the speech from Arlington, each time transmission was attempted. Records were also made occasionally at Darien, but no attempt was made to fit the time of transmission into the schedule of operation of that station. An order wire was set up between Arlington and the two Pacific Coast stations, so that instructions as the the schedule of tests and reports as to its results might be conveniently interchanged.

Radio telephone transmission between Arlington and Mare Island was formally demonstrated on September 29. On this date, Mr. J. J. Carty was inspecting the station at Mare Island. A demonstration for Mr. T. N. Vail was therefore arranged for this date.

The station at Mare Island consisted of a small house near enough to the operating house of the Navy so that the experimental apparatus might be connected to the antenna. The observers at the Mare Island station were Commander G. C. Sweet and Lieutenant Kenshit of the Navy, Mr. A. H. Babcock, consulting engineering Southern Pacific Railroad, Mr. J. J. Carty and others. Messrs. Arnold and Hartley of the Western Electric Company were the experimenters.

Arrangement's had been made whereby Mr. Vail's apartment in New York could be connected with the radio apparatus at Washington. A telephone line extended from the transmitter assigned to Mr. Vail's use to the radio telephone apparatus at Arlington. This telephone circuit was connected to the radio apparatus in place of the telephone transmitter which had formerly been used at Arlington. From Arlington transmission was through the ether to Mare Island. The telephone set which Mr. Carty used at Mare Island consisted of a transmitter connected to a telephone line leading, via the New York test board, to a receiver in Mr. Vail's apartment. The receiver of Mr. Carty's set at Mare Island was one of several which were supplied in parallel by the detector of the radio receiving set. Arrangements were thus made whereby Mr. Vail and Mr. Carty might carry on two-way conversation, but what Mr. Carty and the other observers heard at Mare Island was transmitted from Arlington by wireless.

At the New York toll test board a telephone line was bridged onto the circuit leading from Mr. Carty to Mr. Vail. This line extended to Arlington and contained one-way repeaters so that transmission could take place only from New York to Arlington. At the latter place it supplied a group of telephone receivers which were also connected through a one-way telephone repeater with the line which bore Mr. Vail's speech to the radio apparatus. In this way some dozen observers at Arlington could hear both sides of this unique conversation. The use of one-way repeaters prevented any interaction between the oppositely directed speeches.

At the Arlington station the conversation was listened to by Captain Bullard, Colonel Reber, Commander Hooper, Lt. R. B. Coffman, Lt. Bastedo, Commander Bryant, and members of the telephone system. Messrs. T. N. Vail, U. N. Bethel, J. I. Waterbury, Bancroft Gherardi, and H. P. Charlesworth all conversed with Mr. Carty through the ether.

THE ARLINGTON-HONOLULU EXPERIMENT

Having successfully transmitted over water to Darien, a distance of 2100 miles and over to Mare Island, a distance of 2500 miles, attention was now directed towards reaching the remoter points of Honolulu and Paris. Schedules were therefore arranged for experiments with these stations. With Paris, however, the arrangements as to schedules were necessarily delayed because of the difficulties in cable transmission occasioned by the war.

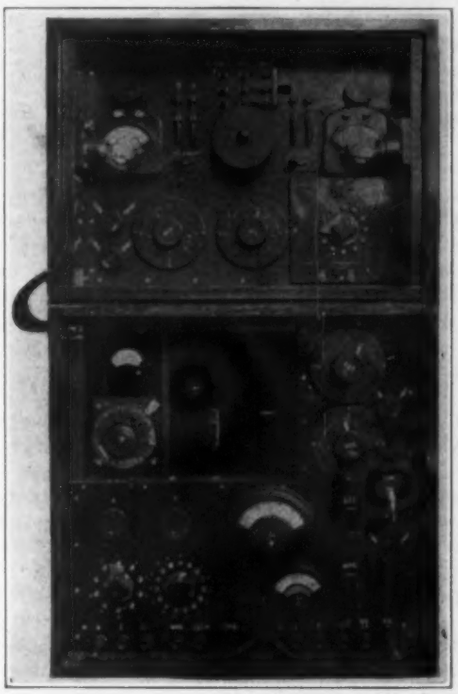


Fig. 11—Battleship radio telephone transmitting and receiving set.

With Honolulu, on the other hand, arrangements for a transmitting schedule had been made shortly before the demonstration of the New York-Arlington-Mare Island transmission. The first deliberate attempt to communicate with this station occurred on the night following the demonstration to Mare Island. Mr. Lloyd Espenschied of the American telephone and Telegraph Company, who was the experimenter at this point, reported by cable the following morning, giving a record of the words which he had heard spoken, and also the name of the speaker, whose voice he had recognized.

THE ARLINGTON-PARIS EXPERIMENT

At Paris were Mr. Shreeve and Mr. Curtis of the Western Electric Company, in which connection it may be mentioned that they are again in France, the former as lieutenant colonel and the latter as lieutenant in the Signal Corps. These experimenters had installed their apparatus in the Eiffel Tower station of the

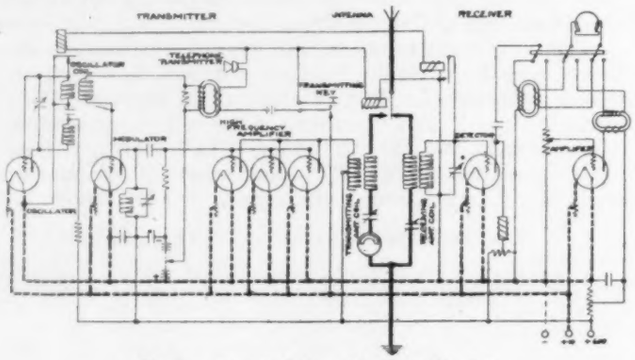


Fig. 12. Circuit Schematic—Battleship Set.

French Army. This courtesy had been accorded our representatives by Lieutenant Colonel Ferrié, director of the military system of radio telegraphy, to whom they had been introduced by Commander W. R. Sayles, naval attaché of the American Embassy. The magnificent spirit which France has shown throughout this bitter struggle is well illustrated by the ability of that nation to consider scientific developments, which apparently were not of immediate military value, and to assist in them despite the demands of the war. The amount of time during which our experimenters could use the antenna was, of course, very limited, and was small as compared to their necessities. The permission to use the antenna at a time when France was wholly engaged in this bitter struggle represents a contribution to science altogether disproportionate to the time which the antenna was available to our men. Unfortunately, however, much of the time when Mr. Shreeve and Mr. Curtis had access to the Eiffel Tower antenna there was interference from other high power stations on the Continent, such as Nauen, Eilvese, Clifden, Norddeich, Lyons and Vienna, which were transmitting upon the same range of wave lengths as it was necessary for us to employ. Instructions from Paris to Arlington, to alter the wave length of the transmission, could be forwarded only by cable, and were, of course, subject to days of delay, so that a satisfactory and flexible working schedule was not to be hoped for. Further, it was possible to transmit in any one day only for a brief period. In spite of these difficulties, promising results in the way of clearly received speech at Paris were secured during short periods that it was possible to arrange for working, between October 12 and October 21. On October 23 as a final demonstration a number of observers, including Commander Sayles and representatives of the French army, listened to the telephone transmission from the Arlington station 3,600 miles away. The wave length used was about 6,000 meters and the antenna current at Arlington about 50 amperes.

On certain of the occasions when we had worked to Paris, Mr. Espenschied at Honolulu had been informed as to the schedule of tests. He had therefore listened in and copied the words spoken at Arlington. The conditions at his stations were, of course, much better than at Paris because of the absence of interference from high power stations in the neighborhood. His observations were upon transmission over a distane some 25 per cent greater than that from Arlington to Paris, and in part over land as well as sea water.

PRACTICAL DEVELOPMENTS

The impending danger of war put an end to the experiments as far as they were concerned with increase in range of transmission. The possibility of applying the principles which had been successfully developed in connection wtih these experiments in trans-Atlantic and trans-Pacific radio telephony to problems of immediate and patriotic value was of course evident. Subsequent developments and experimental tests were therefore directed solely with an aim toward their military value to the Army and Navy. Some of these experimental developments which we made in this connection and the success with which they were accompanied may be of interest.

The first opportunity to demonstrate the use of the wireless telephone in war was presented early in 1916. Secretary Daniels desired a demonstration of what could be accomplished in the way of mobilizing the telegraph and telephone facilities of the country in case of war-time need. This was carried out by the American Telephone and Telegraph Company in May, 1916, and included as part of it wireless telephone communication with a battleship at sea.

The part played by the wireless telephone was to show the possibilities of quick communication by word of mouth between vessels at sea and Headquarters on land. A complete set was built and installed on the battleship New Hampshire. The transmitting to the battleship was done from our station at Arlington. The signals from the battleship were received at the Navy Yard at Norfolk with a set built for that purpose, and were automatically transferred to land telephone lines to Washington. The connections were brought directly to the mobilization switchboard at the Navy Department Annex. When it was desired to talk to the battleship, the regular telephone circuit from the Navy Department was connected up with the lines to Arlington and Norfolk, thus allowing communication by telephone to be held directly with the captain of the

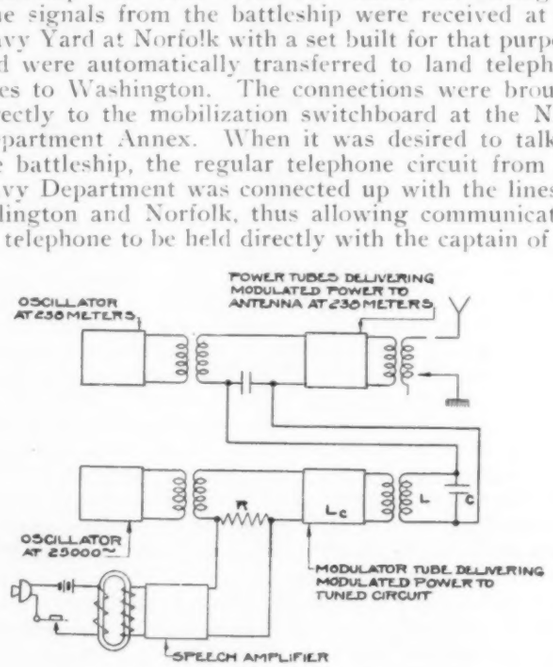


Fig. 13. Schematic of Multiplex Arrangement.

vessel. It was found entirely practicable to hold two-way radio communication as effectively as over wire lines and to secure information or to give orders. Captain Chandler received his orders for maneuvering in this experiment by wireless telephone from Secretary Daniels and Admiral Benson, and he reported to

them each hour his position by the same means. The fact that the lines to the transmitting and receiving land stations came to Washington where these gentlemen were located did not mean that such an arrangement only was possible. This radio system was attached to the long distance telephone line and Captain Chandler talked with Lieutenant Snyder of the Great Lakes Naval Station. It was then connected with the transcontinental telephone line and he talked directly with Capt. F. M. Bennett, commandant of the Mare Island Navy Yard. The ship during these conversations was fifty miles from Norfolk and outside the Capes.

The set installed on the New Hampshire differed from the set at Arlington only in size. The general circuit arrangement and modulation system was the same. The set was installed on the lower bridge deck and the telephone transmitter and receiver were installed on the bridge itself. This allowed the captain, while on the bridge and directing the movement of the ship, to converse without leaving his post.

BATTLESHIP EQUIPMENT

The possibilities of the wireless telephone in Naval Maneuvering were quickly recognized by the Navy Department. Commander Hooper of the Bureau of Steam Engineering asked us to coöperate in making the wireless telephone a useful piece of equipment in naval service. It was decided to build two experimental sets, install them on battleships and give the operating staff an opportunity to investigate and critisize them from an operating point of view. The construction of two sets was begun in December, 1915, and they were completed about the middle of January. A short description of these sets will not be out of place at this time. Each set consisted of complete transmitting and receiving sets with a motor-generator. The receiving set was built to be set on top of the transmitting set. A photograph of the two thus placed is shown in Fig. 11. An extension circuit was provided so as to allow placing the hand set either on the bridge or in the admiral's or captain's cabin, so that it would not be necessary for them to go to the radio room to talk. A duplicate hand set was provided for the operator in the radio room as well as a head

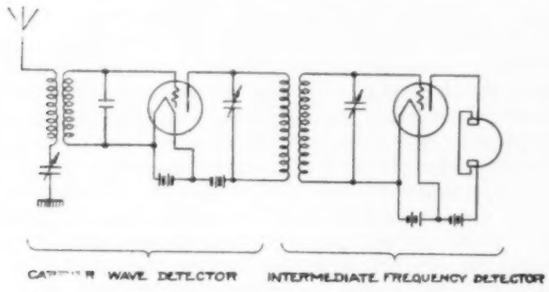


Fig. 14. Schematic of Multiplex Receiving Circuit.

telephone for listening-in. The normal condition of the circuit was with the antenna connected to the receiving set. Any call thus coming in would be received. When a call was received and it was desired to talk instead of to listen, a button on the hand set was pressed which caused the relay operated antenna switch to disconnect the antenna from the receiving set and connect it to the transmitting set and at the same time start the transmitting set operating. This operation required only a fration of a second. It was thus possible to transmit and receive successively on the same antenna by pressing the button whenever it was desired to talk. The wave length range of the set was 600 to 1,200 meters. The circuit is shown in Fig. 12. This system was likewise similar to that at Arlington, but was, of course, quite small and produced only

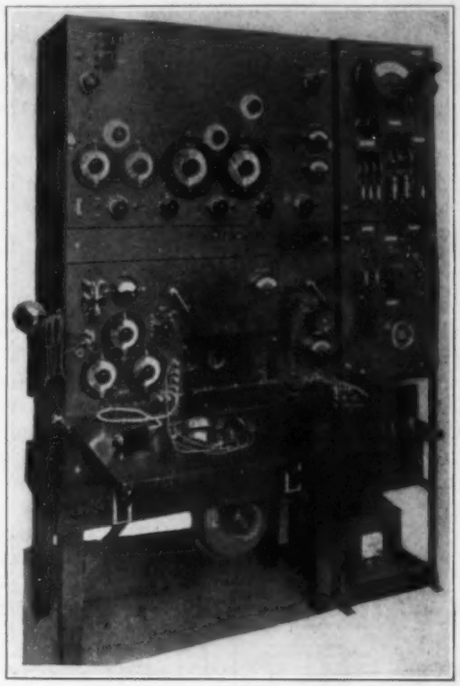


Fig. 15—Multiplex transmitting and receiving set.

one and one-quarter amperes in the antenna. These sets were installed on the battleships Arkansas and Florida at Guantanamo, Cuba, the first part of February, 1916. It was found entirely practicable to hold a two-way conversation between vessels over thirty miles apart. There is no reason to think that was the limit of communication, as some of these conversations were overheard in Jamaica, a distance of 175 miles. No attempt was made for range, as that was not the object in building these sets.

MULTIPLEX WORKING

This experiment pointed out many things in the use of the wireless telephone which it was highly desirable to know. As the result, the Bureau of Steam Engineering approached us later in the same year and requested that a second step be made in the development of a satisfactory set. The fact that this set worked on the same wave lengths as their regular radio telegraph sets, caused considerable interference. It was desired in the telephone field to provide separate possibilities in communication for the Navy and not encroach upon the telegraph. It was, therefore, thought desirable to go to much shorter wave lengths and provide a set which would not interfere at all with the telegraphic operation of neighboring vessels and interfere very little with the telegraphic operations on the same vessel on which the telephone was being used. A few field experiments were made with short wave antennas on two ships in July, 1916, to provide data necessary for building these sets and their design and construction was started in October. The new set

differed from the old one in that it operated on three wave lengths, 150, 189, and 238 metres, and also in that it was multiplex and allowed nine conversations to be carried on three wave lengths. The basis of the multiplex system which was originated by Mr. R. A. Heising is as follows:

Suppose a wave of 25,000 cycles is modulated according to a speech signal. This wave when received in the receiving set and rectified reproduces the desired speech. If, however, instead of radiating this 25,000-cycle wave directly, we modulate a 150-meter wave with it and radiate the 150-meter wave, on receiving and detecting at the receiving station the 150-meter wave there will be produced the wave of modulation, or the 25,000-cycle wave. This second wave is, therefore, produced in the receiving station not by its direct radiation and reception, but is produced there by being carried by the shorter carrier wave. If it is then selected by tuned circuits and detected, the speech signal becomes audible. Therefore, with these sets provided, it was possible to have three ships transmit simultaneously on the same wave length, 150 meters for instance, one ship using an intermediate frequency of 25,000 cycles, the second an intermediate frequency of 35,000 cycles, and the fourth an intermediate frequency of 45,000 cycles. A receiving station tuned to 150 meters would receive all three double modulated

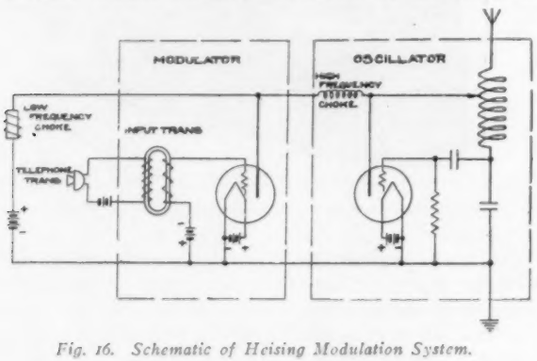


Fig. 16. Schematic of Heising Modulation System.

waves. By using a second tuned circuit, one of the stations could pick out any one of these three conversations by tuning the second tuned circuit to 25,000, 35,000, or 45,000 cycles and detecting and would not be interfered with by the other two stations on the same wave length. A schematic diagram of the system is given in Fig. 13 and a circuit diagram of the receiving system is given in Fig. 14.

These sets were built upon the same plan as the previous ones in that transmitting and receiving sets were built to be placed one upon the other. An illustration is shown in Fig. 15. These sets were installed on the U. S. S. Pennsylvania, Wyoming and Seattle in January, 1917, but scarcely had they been installed than diplomatic relations with Germany were severed and the assistance in the development of apparatus by the operating staff of the Navy was necessarily curtailed.

RADIO TELEPHONE APPARATUS FOR MILITARY USE

Beginning with the entry of this country into the war, the demands for radio apparatus for military purposes have resulted in the very rapid commercial development of this type of equipment. While nothing fundamentally new has resulted from this work, there has been a very practical and valuable result in that the commercial development and manufacture of radio telephone apparatus in general has been put on a basis which otherwise could not have been reached for many years to come.

The first apparatus for war purposes was built at the request of the Navy Department in March, 1917, and consisted of fifteen experimental sets which were proposed for use on submarine chasers. These sets were of the continuous wave type and were intended primarily for telegraph communication, but were also equipped with a telephone modulating attachment. The transmitting element employed four tubes of the type used in the trans-Atlantic experiments, and delivered approximately 1.5 amperes into the small antenna of the submarine chaser. In view of the fact that these sets were immediately replaced by an improved type which will be described later, the detailed construction of these sets need not be discussed, and they are mentioned merely to indicate the Navy Department's practical interest in this type of apparatus at a comparatively early date.

AIRCRAFT TELEPHONY

The most prominent and probably most spectacular development of radio telephony during the war was in connection with its use on military aircraft. While radio telegraphy had been used before for fire control and scouting purposes, its field had not gone beyond that of one-way communication, and was confined practically to the use of simple spark gap types of telegraph apparatus.

Anticipating possible employment of radio telephony in this field, the Western Electric Company engineering organization had done a considerable amount of experimental work in the way of applying the principles demonstrated in connection with earlier experiments in long distance radio telephony to short range work. This work had been carried on for some time under the direction of Mr. H. W. Nichols, and had resulted in the development in experimental form of satisfactory short range apparatus.

On May 22, 1917, Major General Squier, chief signal officer of the Army, called a conference at Washington to consider the feasibility of intercommunication between airplanes while in flight by means of radio telephony. There were present at this conference besides General Squier, Colonel Rees of the Royal Flying Corps of Great Britain; Captain, now Colonel, C. C. Culver of the Signal Corps, and Major, later Lieutenant Colonel, F. B. Jewett, and Captain, later Major, E. B. Craft, who had been assigned from the Western Electric Company engineering organization to engage in this work. At this time plans were in the making for the tremendous aircraft program which was later undertaken by the Army, and it was clear to all that a successful means of communication between battle planes when flying in squadrons would be of inestimable value and would greatly increase the efficiency with which these squadrons could be maneuvered. The early work had shown such promise that there was justification for assuring the Signal Corps that this means of communication could be worked out successfully and applied to aircraft of various types. As a result of this conference, orders were issued by the Signal Corps for the Western Electric Company to undertake the development of a wireless telephone system for the purpose. The experimental equipment available as a laboratory proposition at this time served as a basis for the first experimental trials in the air. This transmitting set did not use the Colpitts system of modulation but the "constant current"

system of R. A. Heising, which was found to be more compact and easily operated. This system comprises a modulator and an oscillator tube with their plate circuits essentially in parallel for audio frequency currents. They are supplied from a generator through a choke coil whose function is to maintain a practically constant current to the two tubes, no matter how the plate currents may vary individually. A circuit diagram is shown in Fig. 16 and the operation is as follows:

When the transmitter is not actuated there is a certain normal value of voltage impressed upon the grid of the modulator tube, this value being adjusted until the plate current of the modulator is about the same as that of the oscillator. Now the characteristic curve of Fig. 1 shows that as the grid becomes more negative the plate current decreases at constant plate voltage, and with positive grid voltage it increases. This may be described by saying that the resistance of the plate circuit may be varied by varying the grid voltage, and inspection of the curve shows that this variation may be from a very high value (point $-E$) to a small value for positive grid voltages. In the modulating system of Heising the transmitter voltage acts upon the grid of the modulator and causes the resistance of the plate circuit to vary through a wide range in accordance with the speech voltage. Since this circuit shunts the plate circuit of the oscillator tube (at audio but not at radio frequencies) the oscillator will be robbed of current or have additional plate current forced through it in accordance with the speech voltage. Its output will thus be varied and its has been found that speech is modulated in this way with very good quality. The efficiency of this system is high and greater than that of an "absorption" system in which power is variably diverted from an oscillating circuit and wasted in a modulating device. In the constant-current system the voltage and current in the oscillator rise periodically to nearly twice their values when the transmitter is not acting, which fact accounts for the increased efficiency.

EXPERIMENTAL WORK

This fundamental plan seemed to be the most feasible one to pursue and one June 5, 1917, another conference was held at Washington to agree upon the various technical features and make plans for carrying out field tests.

It was early realized that the principal difficulty in airplane telephony would be the noises due to the motor and the wind, so that attention was concentrated on the problem of providing against this difficulty both in the transmitting and receiving ends of the combination. Laboratory work was directed particularly toward producing a form of telephone transmitter or microphone which would be as insensitive as possible to these extraneous noises and at the same time be responsive to the voice frequencies. In order that this work might be carried on at high speed, a sound proof room was constructed and a device provided which reproduced very accurately the noises of the engine exhaust. By the first of July experiments looked sufficiently promising to warrant tests in the field. On July 2 a complete radio telephone transmitting equipment was taken into the air and speech of good volume and quality was received on the ground, with the transmitting plane two miles away. The development of a suitable receiving head set was carried on simultaneously and it was found possible to devise a leather helmet with the receiving elements so disposed and screened from external noises that the weak radio signals could be readily observed. On July 4 experimental receiving equipment was taken into the air and Mr. L. M. Clement of the Western Electric Company successfully received speech from the ground at a distance of several miles.

As stated before, the apparatus used in these tests was of an experimental form built in the laboratory. The transmitting set had an output of 0.7 amperes at a wave length range of 200 to 400 meters, the antenna being a trailing wire about 100 meters along.

DEVELOPMENT OF APPARATUS

With the information resulting from these tests, the development of a practical airplane set began at once. During the previous month comparative tests had been made on a number of proposed modulating systems, with the result that the constant-current system previously described seemed best for the purpose. The problem now was to produce sets of minimum size and weight, physical structures which would withstand the extreme vibrations and jars encountered

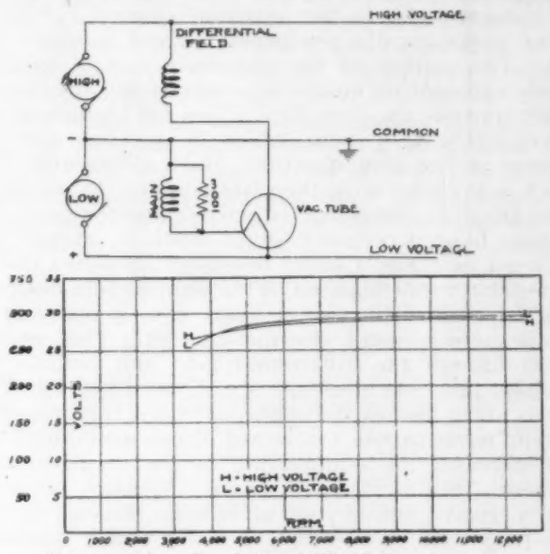


Fig. 17. Voltage Regulation of Wind-Driven Generator.

in flying, especially in landing, the most convenient disposition of control elements, suitable sources of power for both high and low voltage, and a form of antenna which would not interfere with the evolutions of a plane in squadron formation.

It was realized that the solution of the last mentioned problem would consume more time than was at our disposal, and while work was immediately started in the field on antenna measurements and study, the design of the sets proceeded on the basis of using a trailing wire antenna.

The working out of a practical helmet design proved to be more difficult than the success of the earlier experiments indicated. It was found that the degree of interference expereinced changed very rapidly with slight imperfections in fit. The problem was also complicated by the necessity of providing means for using oxygen at high altitudes, and of providing for the comfort of the wearer over a period of several hours. It was found that a very slight amount of pressure on certain portions of the ear caused excessive pains and headaches after a very short period, and

the final design was a compromise between comfort and efficiency as to sound insulation.

The problem of power supply was an interesting one. It was required that the weight should be reduced to a minimum, which precluded the possibility of employing storage batteries. There are obvious objections, also, to attaching any form of generating device to the propelling engine. Consideration of all the factors led to the adoption of a wind-driven generator for the purpose. This generator of about 100 watts direct current output was required to produce a potential of 300 volts for the plate circuits of the vacuum tubes, and a potential of 25 volts for the filament circuits. It is necessary, to insure most efficient operation, that the filament current be kept constant, and the fact that the specifications called for operation with airplane speeds varying from 40 to 160 miles per hour made the problem of voltage regulation loom large. Ordinary forms of electro-mechanical regulating devices did not prove to be successful and while it was probable that something of this type would eventually have been developed, the problem was solved by a very ingenious arrangement proposed by Mr. H. M. Stoller, in which the vacuum tube is the essential element. Fig. 17 shows, schematically, the generator and regulator circuit. The voltage of the generator is held approximately constant by means of a vacuum tube regulator, which controls the field flux. Two field windings are provided, the main field, which is in series with the filament of the regulator tube, and a differential field which is in series with the plate circuit. At minimum speed the differential field is inactive and the generator behaves like an ordinary shunt machine, except that the main field has a small resistance in series due to the regulator tube filament. This filament is so designed that the main field current heats it to a temperature which gives a small electron current. This current flows through the differential field and reduces the resultant flux. At minimum speed, the differential current is small, but as the speed increases, the main field current tends to rise (as in any shunt generator) and this increases the temperature of the regulator tube filament. The electron current is, therefore, considerably increased, which current, flowing through the dfiferential field, reduces the generator flux and this restricts the rise in voltage. Due to the fact that the electron current of the regulator tube increases very rapidly with increase in filament current, the voltage is held practically constant between 4,000 and 12,000 rev. per min. The 1.5-ohm resistance units are provided so that the regulator may be set to give different voltages by cutting them in or out of the main field. The 100 ohms shunt resistance is used to prevent hunting.

Upon the completion of the next set of models, field tests were resumed and on August 20 the first two-way telephone conversation between two planes in the air was successfully accomplished. After this first trial, Major Bartholf and Lieutenant Stevens of the Signal Corps held two-way conversation between planes with very satisfactory results.

In the August tests at Langley Field two general schemes of control were considered,—manual means for transferring from the transmitting to the receiving position, and automatic means for accomplishing the same result through the operation of a remote control relay. It was concluded, because of its simple construction, to employ the manual means of control, the idea being to locate the set in the observer's position in the plane.

On August 22 an informal demonstration of talk from airplane to ground was given for Secretary of War Baker, General Scott, and Colonel Baker. These experiments conclusively demonstrated the practicability of the system and apparatus, and we felt justified in proceeding with its commercial development.

(To be concluded.)

St. Paul Ready for Unification

Unification of telephone service in St. Paul, Minn., has been approved by the operating board and Postmaster General Burleson. This is contingent upon the company financing the cost.

G. W. Robinson, president of the Tri-State Telephone and Telegraph Company, telegraphed this information from Washington to officials of the company. Mr. Robinson's telegram stated that financing arrangements were very difficult because of the failure of the company to receive sufficient revenue to take care of the increased costs, and were made even more difficult by the recent addition to operating costs by the increase in wages, effective May 1.

Officials of the company estimated that the increase in wages to the employes would amount to more than $425,000 a year.

R. L. Barry, general superintendent of the company, states he is not authorized to start the work of consolidation until financing arrangements are completed, and that he expects that a rate increase must be secured in St. Paul. The company is ready to push the work of unification as soon as it can proceed, he said.

When financial arrangements are completed it would take approximately eight months to complete the unification of the service, Mr. Barry said.

The rate on office telephones will have to be increased $1 a month and for residence telephones 50 cents a month, in the opinion of officials of the company.

The unification will cost $300,000 and the ultimate conversion of equipment to the automatic alone will cost $2,000,000. This conversion will be deferred until the financial, material and labor markets are more favorable.

Property worth approximately $2,000,000 will be acquired by the Tri-State Telephone company from the Northwestern Telephone company as a result of the consolidation.

The terms of the merger give the Tri-State company entire control in St. Paul and the Northwestern sole control in Minneapolis. Property of the former corporation in Minneapolis is taken over by the Northwestern company and the revenue applies in St. Paul.

The excess of the property, however, goes to the Tri-State, which has the option of paying the $2,000,000 in cash or in non-voting preferred Tri-State stock.

The two corporations are absolutely divorced. Which plan of payment will be used will not be determined until the appraisal is completed.

The connecting of the two systems, which permits a manual instrument user to call an automatic subscriber direct and the reverse, will not decrease the switchboard forces. Although the telephone user will not have to ask the operator for a number, operators still will be needed, as they must make a connection in a manner similar to the present system.

European Telephone Practice

What the Telephone and Accessory Manufacturers are Doing to Advance Art

BY FRED W. SCHOLZ

ADAPTATION of Telephone Exchanges to Telephone Traffic.—In the theory of variations of numbers we have to find values, which shall group themselves according to some definite law either above or below some average value. Such values are all the more rare, the greater the variations are different from the average value.

If we consider these deviations as "errors," we can say that we have to find a law of errors, i. e., a law which shall describe the relation between the magnitude of the error and the frequency of its occurrence. Equation (5) is such a law without a doubt, for it states that an error of the magnitude Z_{m-c} occurs with the frequency w_c in which Z_m is the average call number.

In looking for such a law and in solving the problems confronting us in telephone work, we might try the method of smallest squares, which is built up as follows: 1. Let λ be the error by which the measurement or the value adopted for a certain computation differs from the most probable value. As such most probable value we may assume the arithmetical mean of the values of the various observations in the course of the investigation. We want to find an equation $f(\lambda)$, which shall represent the frequency of the occurrence of the error λ.

But we have to make some further assumptions. 2. Equally large positive and negative errors occur equally often, or in other words, the errors lie symmetrically to the arithmetical mean. 3. The greater the error, the smaller is its frequency.

With these assumptions in mind, Gauss deduced a law of errors, which has the form:

$$f(\lambda) = \frac{h}{\sqrt{\pi}} e^{-h^2\lambda^2} \qquad (19)$$

The parameter h depends on the distribution of the errors above and below the arithmetical mean. If we designate the arithmetical mean by a and if the various measurements give the values b_1, b_2, b_3 . . . . . , and further if we designate the errors:

$$a - b_1 = \lambda_1$$
$$a - b_2 = \lambda_2$$
$$a - b_n = \lambda_n,$$

then we must seek an "average" error with the equation:

$$\mu = \sqrt{\frac{\Sigma\lambda^2}{n}} \qquad (20)$$

i. e. the average error is equal to the square root of the sum of the squares of the errors, divided by the number of errors.

The mathematic law of compensation teaches us further that in Gauss' law of errors:

$$h = \frac{1}{\mu\sqrt{2}} \quad . \quad . \quad . \quad . \quad (21)$$

We want to find and see whether these rules can be adapted to the variations in the different phases of telephone traffic.

First Assumption: We find the statement: In the variation of quantity the value to be used in figuring the positive and negative variations is not equal to the arithmetical mean. The value from which we start out to make the computation according to equation (8), is:

$$x = \frac{Cs - C - S + s + 1}{S - 2}$$

Since $\frac{C}{S}$ is the arithemtical mean of the calls, the zero point of errors will deviate the more from the arithmetical mean, the less we can neglect $-C - S + s + 1$ as against Cs and the less we can neglect 2 as against S. If C and s are small, for example $C = 3{,}000$ and $s = 10$, and if S is large, say $S - 10{,}000$, then the arithmetical mean is to be found for $s = 10$ at $c = 3$ calls and the zero error point lies almost at $x = 2$. It is therefore only 66 per cent of the arithmetical mean. Our first assumption is therefore not borne out by facts.

Second Assumption: Do the errors lie symmetrically to the zero point of errors? Let us assume that a curve $f(x)$ has two branches which are symmetrical to one ordinate above the abscissa m. Under these conditions $f(m+x) = f(m-x)$. But closer investigation of such a curve would show that the two branches are not equal and that the right side decreases in a much slower ratio than the left side. The relation between two ordinates following close one upon the other is not equal even though the distances of the two branches from the zero point of errors be the same. If we designate the two branches on either side of the zero point of errors as $\frac{N_{x+1}}{N_x}$ for the left side and $\frac{N_x}{N_{x+1}}$ for the opposite side, we would find the values to be:

on the left side 0.9750	and on the right side 0.9776
0.9542	0.9560
0.9040	0.9333

showing what a difference there is between the two sides. We can sum up by saying that the variations in the differences of quantity do not lie symmetrical to the zero point of error.

Third Assumption: The greater the error, the smaller will be the frequency. This is also true in the case of our problem and is the only one of the three assumptions that holds good.

Simultaneous Traffic: We have now deduced various equations which will aid in computing the total number of calls that can be made under the assumption that the law of probability can be applied to telephone traffic. The problem now remains to find the simultaneous traffic, i. e., if we know that 750 calls go out into one direction within one hour, how many trunks and wires must we have to meet this traffic?

An equation which might possibly be used to meet this problem is the equation $V = CT + 2, \sqrt[3]{8\,CT}$ but it has its drawback in the fact that the equation has no factor which takes consideration of the great dependency of the ratios $\frac{S}{s}$ and $\frac{C}{S}$ Johannsen, a Danish engineer, works from a different standpoint. He observes the amount and direction of calls made by various subscribers during one or two months of telephone service

and then draws conclusions as to their traffic per year. From these observations he then forms an arithmetical mean and then he either adds or subtracts an "average" error. This average error he computes in terms of $\sqrt{N}$, in which N is the readings taken from the registering apparatus that registers the calls for the different subscribers. He then corrects the error $\sqrt{N}$ by assuming $4\sqrt{N}$ since he finds the former one too small.

These are a few of the problems that confront the telephone engineer in his theoretical work. The application of the theory of probabilities to the use of telephone traffic problems is not a very old one and stands as yet in its initial stages. No doubt but that it is full of mathematical theory, a great deal of which can be discarded or simplified, leaving only the most important equations for immediate use. Nevertheless, a theoretical discussion has its uses also and points at least to the possibilities that lie before the telephone field in adapting the workings of mathematics its its higher branches to the solution of problems which we usually classify directly within the practical field of the telephone engineer.—*Telegraphen Versuchamt.*

Simplification of Wood Preservation Process

WHEN using mercuric chloride for wood preservation, particularly for telephone poles in the kyanizing process, the concentration of the preservation solution should be as uniform as possible. In order to keep it at the proper concentration, frequent tests must be made, and the present article attempts to propose some methods which will simplify the preservation process and will still give the same good results.

The preserving fluid does not penetrate very deeply into the wood as a rule and yet the preservation effect is so good that there are very few if any localities where poles are used without preservation treatment. The solution to be used is kept at a concentration of about ⅔ per cent of mercuric chloride salt and the poles are left in the solution from one to two weeks. The poles are stripped of bark, of course, have been air dried and are completely immersed in the liquid. During the process the wood fibers absorb a large quantity of the preserving fluid and this naturally weakens the concentration of the salt in the liquid considerably, so that after a certain length of time the solution has to be strengthened in order to keep up its action on the poles. One of the great drawbacks of the kyanizing process is the necessity of adding more concentrate and stirring up the mixture, as otherwise the new salt precipitates to the bottom. If a method could be found that would eliminate this replenishing of preserving liquid and still give the same good results after completion of the process, much time and labor could be saved.

The question of the amount of sublimate absorbed by the poles can only be solved if we consider the various kinds of timber that are used for telephone poles. Spruce, fir and pine are probably the most common trees used for poles and we will consider the problem from their standpoint. In order to reach valid conclusions, observations and tests were made in a wood preservation plant using the kyanizing process, giving the spruce and fir poles 7 days for immersion in the solution and the pine 10 days. In order to find out the quantity of sublimate absorbed by the various poles, we must know the length, diameter and cubic contents of the poles. As it was impossible to make exact measurements on the many poles treated in the course of the tests, averages were taken, the average diameter being measured at the top and bottom of the poles and from these the volume and total surface of the poles was computed. The results are much more accurate than those that are usually computed from theoretical tables and correspond closely to the averages found in actual telephone pole service. The area of the absorption tanks in which the poles are immersed in the liquid is known. Starting out from this area F the height of the level of the solution in the tank after immersion of the poles was measured and called h_1. The percentage of sublimate in the solution was set down and designated in kilogram units and marked k_1. This value of weight of sublimate per volume of solution is close to the standard concentration value of ⅔ per cent. The corrosive sublimate found in the tank at the beginning of the process is computed as follows. The vat holds a volume of liquid equal to $V = F \cdot h_1$. If we deduct from this volume the cubic contents of the poles immersed in the vat V_h, we will have the volume of the mercuric chloride solution $V_1 = F \cdot h_1 - V$ and the weight of the sublimate present at the beginning of the process will be found to be $S_1 = V_1 \cdot k_1 = (F \cdot h_1 - V_h) \cdot k_1$.

During the process the level of the liquid in the vat sinks owing to the absorption of the poles on the one hand and the evaporation of some of the sublimate on the other hand. The concentration will be smaller than ⅔ per cent and will drop from k_1 to k_2. It becomes necessary to add stronger concentrated solution. But as no solid sublimate can be added, the volume of liquid in the vats will also be increased. Before pumping more solution into the vats, the state of the liquid in the vat must be read off and from this quantity k_2 one can determine the quantity of sublimate consumed to this point. The volume of the mercuric solution is now $V_2 = (F \cdot h_2 - V_h)$ and t the quantity of the sublimate is $S_2 = (F \cdot h_2 - V_h) k_2$. The difference $S_1 - S_2$ up to this point has therefore been taken up by the fibres of the timber.

Now if we carry out the addition of strongly concentrated solution, we have the state of the solution as h_3 and the concentration as k_3, and at the end of the process the relative values will be h_4 and k_4. As before we find $S_3 = (F \cdot h_3 - V_h) \cdot k_3$ and $S_4 = (F \cdot h_4 - V^h) \cdot k_4$. The difference $S_3 - S_4$ corresponds to the quantity of sublimate absorbed by the poles. Altogether the poles have absorbed, provided no other addition was necessary, $(S_1 - S_2) + (S_3 - S_4)$. From the known figures as to volume and the surface of the poles we can compute the quantity of sublimate absorbed by the cubic capacity on the one side and by each unit of surface on the other side. The table shows the values obtained in preserving a certain number of pine poles. The vats are filled with the solution to the limit. The duration of the saturation process was 7 days. In cases 1 and 2 more solution was pumped into the vats in order to raise the strength of concentration of the liquid. This solution was given the same strength as the solution in the vats in the first place. In the other cases the concentration was raised by adding more strongly concentrated liquid. It is seen from the table, that the absorption of sublimate per unit of volume and of surface is quite different in the different methods of filling and refilling the vats.

The most important question hinges on the influence of concentration on the entire process. It is quite possible that a greater amount would be absorbed by the timber if the latter were laid into a more strongly con-

PINE TREATED SEVEN DAYS.

Series	No. in vats	Volume in cbm.	Total are in sq. m.	Concentration of bath in % sublimate. K_1	K_2	K_3	K_4	Absorption of sublimate in kg. per m^3	m^2	Absorption of bath in liters per cbm. timber
1	446	91.5	2020	0.72	0.67	0.67	0.66	0.77	0.035	41.5
2	209	90	1577	0.72	0.71	0.71	0.66	0.86	0.049*)	53.3
3	401	84.3	1842	0.70	0.67	0.70	0.67	0.97	0.044	56.9
4	419	87.8	1921	0.67	0.64	0.69	0.66	0.94	0.043	66.0
5	522	100.5	2294	0.66	0.64	0.70	0.66	0.63	0.028	37.8
							Average	0.83	0.040	

PINE TREATED SEVEN DAYS.

Series	Number of Poles	Volume in cbm.	Total surface in sq. m.	Concentration of bath in % sublimate at begin'ng	at end	Absorption of sublimate in kg. per cbm.	sq. m.	Absorption of liquid in liters per cbm. timber.	Decrease of concentration in %
1	535	107.3	2381	0.78	0.72	0.77	0.035	58.7	0.06
2	456	87.1	1989	0.76	0.71	0.78	0.035	43.6	0.05
3	298	83.5	1635	0.72	0.66	0.68	0.034	33.5	0.06
4	440	87.2	1945	0.71	0.64	0.85	0.038	43.6	0.07
5	369	73.8	1668	0.71	0.66	1.14	0.050	77.2	0.05
6	470	94	2121	0.71	0.65	0.66	0.034	35.1	0.06
7	436	83.2	1817	0.71	0.65	0.92	0.042	57.7	0.06
8	370	76.4	1698	0.70	0.65	0.77	0.035	36.6	0.05
			Average	0.73	0.67	0.82	0.038	...	0.06

centrated solution. But if we were to arrange the results obtained during the process according to absorption of solution by the poles, we would find that the concentration of the solution does not determine the quantity of absorption of sublimate by the pole, but that the quantity of liquid that can be absorbed is the first factor under consideration in this respect. This latter, however, cannot be controlled in any way and depends on the nature of the wood and the state of dryness in which it is at the time of kyanization. Starting out from this assumption we may assume that small changes of concentration through addition of solution to the bath have little or no influence upon the process.

In order to put this argument to the test another series of pine poles was laid into a concentration which was much stronger than the first one, being 0.7 per cent and more. Here no new solution was added and the poles were left in the strong solution for seven days without change, except that the solution was agitated at stated periods to keep the sublimate from settling at the bottom. The results are shown in the second table. If we watch the absorption of sublimate by the poles closely, we will see that this is about in the same ratio as that in the first series; per unit of volume they vary from 0.66 to 1.14 kg. and per unit of area between 0.034 and 0.050 kg. The average values are very close in the two series. It is obvious in this case, that the concentration is not the decisive factor in the first analysis for the absorption of salt.

The two series of tests give a very important conclusion: Practically speaking, we obtain the same results, whether we try to keep the concentration of the sublimate solution at the proper strength by adding new sublimate solution from time to time, or whether we place the poles in the very beginning into vats with highly concentrated baths.

The second series of tests was made with spruce and fir, which are used quite a little for telephone poles. A fir pole will not take up as much preserving fluid in the same quantity of time as a pine pole. If we wish to obtain approximately the same results as with pine, we must saturate the fir pole much longer in the sublimate, the period usually running to 10 days as against 7 days for pine. The two tables show results obtained with fir, immersed 10 days in the sublimate bath. The first table gives the case of fir in which the sublimate solution was replenished from time to time. The absorption of sublimate is relatively high, due to the high power of absorption of these particular poles. In the second table the solution was chosen of higher concentration and no new solution was added during the test. Here the average values of salt absorption are lower than for pine and the average absorption of liquid per unit of surface and volume does not differ very much from that of the pine poles, which had been immersed only 7 days. Even though the concentration of the salt solution was chosen much higher, still the absorption by the poles was no greater in proportion, bearing out the conclusions drawn before.

In summing up we can say that the quantity of sublimate absorbed by the various types of poles differs even for the same kind of timber, depending on the nature of the poles and their state after treatment preliminary to the preserving process. The quantity of corrosive sublimate to be absorobed by the wood cells will therefore depend to a very large extent on the quantity of liquid that the wood can absorb. We obtain practically the same absorption of corrosive sublimate, whether we keep the concentration as near to the standard ⅔ per cent by constant replenishing of the vats, or whether we use a stronger concentration of perhaps 0.7 per cent in the first place and let the poles lie in that for the requisite number of days.

This then leads obviously to the possible simplifying of the kyanizing process. If the poles will be equally well protected against decay by letting them lie in a strongly concentrated solution of corrosive sublimate, we can save the trouble of periodic refilling of the vats, and the accompanying testing of the concentration of the bath. All that need to be done is to lay the poles in the vats, cover them to a certain height above the poles with concentrated solution of the proper strength and then leave them alone for 7 or 10 days as the case may be, perhaps only agitating the solution at certain intervals.—*Elektrotechnik U. Maschinenbau.*

FIR, TREATED TEN DAYS.

Series	Number of Poles	Volume in cbm.	Total surface in sq. m.	Concentration of bath in % sublimate. K_1	K_2	K_3	K_4	Absorption of sublimate in kg. per m^3	m^2	Absorption of liquid in liters per cbm. timber
1	542	101.4	2245	0.71	0.69	0.69	0.64	0.93	0.042	69.1
2	493	98.7	2190	0.70	0.66	0.70	0.69	1.01	0.045	91.1
3	236	96.3	1724	0.67	0.64	0.68	0.64	0.80	0.045*)	41.5
							Average	0.91	0.044	

FIR, TREATED TEN DAYS.

Series	Number of Poles	Volume in cbm.	Total surface in sq. m.	Concentration of bath in % sublimate at begin'ng	at end	Absorption of sublimate in kg. per m^3	m^2	Absorption of liquid in liters per cbm. timber.	Decrease of concentration in %
1	426	88.6	1947	0.73	0.68	0.56	0.025	22.2	0.05
2	416	90.4	1936	0.71	0.66	0.61	0.028	26.5	0.05
3	441	87.7	1936	0.71	0.66	0.76	0.034	43.3	0.05
4	368	73.6	1663	0.71	0.66	0.80	0.035	27.1	0.05
5	398	79.6	1799	0.71	0.64	0.98	0.043	32.6	0.07
6	258	102.7	1847	0.70	0.66	0.86	0.048	91.8	0.04
			Sum	0.71	0.66	0.76	0.035	...	0.05

The Physiological Effects of Electric Currents

THE belief which is held by very many people that current of high tension is more dangerous than current at low tension is not at all true, even though not only laymen but electrical engineers, workers in electrical lines and physicians seem quite convinced of the truth of such an assertion. In order not to be misunderstood, it might be well to say that in general low tension currents represent less danger, because dry skin and dry footwear are enough insulation against current of low voltage to prevent any dangerous effects to the person working near the live wires. If neither of these two conditions are present, fatal accidents can occur even with low tension current conductors.

There is another erroneous belief that it might be well to combat, and that is, that an injured person, who has been in contact with a live wire and has been terribly burned, is more likely to meet his death as a result of the contact than another victim who shows very few or no outward symptoms at all of the electric shock. As a matter of fact, unless vital organs have been injured by the current, there is more hope in the case of the burned victim than is in the case of the unconscious person, who shows no burns. This will be discussed later on in more detail.

These various statements and electrical phenomena which seemed to contradict each other causesd medical men in various countries to make experiments along electrical lines in this relation, making use of various animals in the investigations.

Of older work along these lines we must mention the work of Professor Kratter, a Hungarian scientist at the University of Prague who published part of his work as far back as 1896. He was one of the first ones to prove that danger to life does not increase proportionally with increasing voltage and that injury from contact with a live conductor becomes more serious in direct proportion to the length of time of contact with the conductor. He also showed that frequent application of an otherwise harmless current will lead to fatal results. The dissections made by him on animals killed by the electric current, however, never gave a clear picture of the changes in the animal body due to the current and characteristic markings pointing towards death through electric current were lacking. It is true that he found the cardiac muscles and the coronary arteries bloodless after dissecting the body, evidently showing that the blood had been withdrawn from the cardiac region and all blood supply cut off, but this condition is found in other causes of death as well and is not restricted to death through electric current. Kratter therefore always maintained that pathology does not reproduce any changes which are caused by the deadly current which would tend to give a clear picture of the changes in the body through the effect of the current, and he claimed that death was due to molecular changes in the nerve cells.

Very extensive experiments were made by the Swiss physicians Prévost and Battelli during the years 1890 to 1900. They paid careful attention to the nature of the current, the voltage, frequency, time of contact and places of contact and laid the foundation for very accurate results which are considered the basis for later recearches in that field. They made observations first of all on the effect of the discharges of Leyden jars upon living animals. As these results are of practically no consequence for practical work, we will not say more about them except to state that even the most powerful discharges from condensers or from batteries of Leyden jars cannot kill a human being, even though the effects from discharges from such a source may be extremely disagreeable. We are much more interested in the experiments made with industrial currents.

Dogs were used for experiments. If the electrodes were laid in the mouth and introduced into the rectum, electric currents had the following effects: At 5 to 10 volts only a transitory increase of blood pressure occurred. At 20 to 120 volts the animal died owing to interference with the functioning of the heart, even though respiration stopped only after a certain later period. At 240 to 600 volts death resulted both through interference with the heart action and cessation of breathing. At 1,200 volts, however, neither heart action nor respiration was interfered with, and at 2,400 volts and over respiration was partially suspended and could be revived by the usual respiratory methods.

The disturbance of the heart activity at voltages below 600 could not be relieved by the usual methods of resuscitation and at immediate opening of the thorax the heart was found to be palpitating with movements quite different from the usual rhythmic beating. There was no intimation of suction or pressure movements of the heart muscles, but on the contrary the surface of the ventricle was found to be in wave-shaped flickering movements. Since the interference with the action of the heart stops the circulation of blood, the result is a complete withdrawal of all blood from the cardiac region, the heart is made bloodless and death results.

In the cases of a few animals like dogs, apes, and cats the palpitation of the heart is deadly; in others, however, as in rats and rabbits, the palpitation passes over into the usual rhythmic beat after the current contact has been removed. It is interesting to note that the auricles, not the ventricles, beat anew in most types of animals, as also in man. For that reason one can often note heart beats at such places as the arteries of the neck, even after the heart has already ceased beating.

Palpitation of the heart could be observed only below a certain voltage, in the dog below 600 volts. When higher voltages were used no palpitation took place, but the heart ceased beating during current contact. After current contact had been broken, the ventricles of the heart began to beat again, provided the time of contact did not pass beyond 5 seconds. If contact lasted from 10 to 15 seconds the heart took a longer time to start beating again.

The final result, whether fatal or not, also depends on whether the heart lies in the direct line to palpitate at 5 volts, if the electrode is laid directly against the heart. In this way palpitation of the heart can be produced up to about 120 volts, but at 240 volts no palpitation takes place, the heart stops beating. If the electrodes are placed on both sides of the dog's breast, palpitation of the heart is caused after using 30 to 40 volts. The animal tries to flee, yelping meanwhile; then it totters for a few seconds and falls on its side, still breathing, however, until death takes place.

Battelli showed that in a few animals the contact with a high tension current relieved palpitation of the heart, so that the heart took up its old rhythmical beat after a short time. If the current was too high, of course all heart action ceased. But only a few animals react in this way, such as rats and rabbits; not, however, cats and monkeys.

He also investigated the influence of periodicity upon the animal body. With increasing frequency the tension had to be increased to bring about a deadly result. With the usual number of periods used in industrial currents, however, comparatively low voltages are sufficient to kill animals. On the other hand, we know that Tesla currents of very high frequency are harmless. Electrical science has given to man with this discovery a wonderful means of curing certain diseases by heating the human body by means of these currents, which are used both externally and internally by medical men. The currents used for this purpose run up to 3 amperes and 800 volts, and have a periodicity of about one million. When heating the body by this means the latter is heated not only at the contact places but through the entire current path.

The experiments of Prévost and Battelli also showed that when using alternating current a time of contact of ½ second was not sufficient to cause palpitation of the heart, whereas at 1/15 seconds contact the subject lost consciousness. Cessation of breathing rests on restriction of the functions of the nerve centers and the degree of retardation of action increases with current density and length of contact, and affects the brain to a marked extent.

Battelli also expressed his belief that the final effect of the current contact is due not so much to the tension of the current as to the current strength. Life or death will depend very largely upon the current density within the organis of the victim. Very accurate tests in this direction were made at the request of the French government by Dr. Weiss of Paris in 1911. Dr. Weiss, who used only dogs for his experiments, designed an ingenious method to determine graphically the influence of the current upon heart beat, blood pressure and respiration. Diagrams made in the course of the experiments show the effect of lower and higher tension currents, both direct and alternating.

To make the experiments on respiration, a T-shaped thin pipe was placed in the windpipe of the animals, so that the latter could breathe freely. The free end of the tube led to an apparatus provided with a stylus, which reproduced all respiratory movements on a revolving drum. At the same time a second stylus described the blood pressure curve above the respiratory curve. For this purpose a mercury manometer with a float, which latter carried the stylus, was employed. This was connected by a rubber tube with a thin tube passed into an artery. The duration of the current contact was also recorded on the drum. The electrodes were in most cases laid against one front and one hind paw. The current had 42 periods, and from 0.035 to 0.038 amperes. The observations showed the immediate increase of blood pressure when disconnecting. However, the heart activity was not interrupted. Respiration is more energetic and quicker and ceases for a brief period when a second contact is given. But it becomes normal soon after the current is disconnected again.

The next series of experiments was made with current of 0.116 amperes and 100 volts. The animal dies, owing to interference with the heart action, as the blood pressure drops after removal of current contact and does not improve again. Respiration, which is irregular, starts again after contact break but soon ceases, owing to failure of the heart action.

The third series used current at 2700 to 4600 volts. The animal withstands this current contact. In the case of one of the subjects, the animal was able to stand current contacts of that magnitude before death set in. Here is a proof, then, that the disturbance of the heart action with such a high voltage current of 7 amperes was only temporary and did not cause death, while a lower current (0.45 amperes) brought about death.

The following series bring the proof that it is not the tension but the current strength which is decisive for the deadly effect. An alternating current of 0.0425 amperes at 4500 volts and a resistance of 99,000 was applied and left the animal alive. The next current of higher amperage (0.089 amp.) at 4500 volts but with a lower resistance of 49,500 brought death with the same phenomena observed in the 100 volt contact.

Then the various current paths were studied. An electrode was laid in contact with the head and the other under the chin, so that the brain but not the heart is in the current path. At 1080 volts, 0.385 amperes with a resistance of 2500 respiratory trouble is experienced by the animal due to interference with the functioning of the nerve centers in the brain, but the heart keeps on working, even though irregularly. The animal was able to stand a triple contact of the same nature without injury, but died immediately when the contact was laid against a hind paw.

Finally the relative effects of d. c. and a. c. were tried out. The current strengths of 0.207 and 0.258 ampere would be deadly in the case of alternating current, but with direct current it takes a current of 0.339 amperes to cause death. Direct current therefore requires four times the strength of alternating current to cause the same injuries, a fact brought out by Battelli as well. But Dr. Weiss claims that direct current can bring about incurable injuries which alternating current cannot do. He used a frog for his experiments, bringing one of the legs in contact with the direct current source, while the other lay outside of the current path. The frog was then shocked with direct current and then his position was reversed so that the other leg was brought into the current path of an alternating current. After the frog had recovered consciousness he was placed in water and it was noted that he could use the leg exposed to the a. c. shock in swimming, while the other one, exposed to the d. c. seemed to be paralyzed. (to be concluded.)—Journal des Physiologie et de Pathologie and Elek Zeit.

Kansas City Merger Rates

Further assurance that Kansas City, Mo., telephone rates will not be disturbed as a result of the merger of its two companies was given in a telegram received by Col. E. M. Harber, city counselor, from A. F. Adams, president of the Kansas City Home Telephone Company and supervisor of the Postal Telegraph lines for the wire administration.

The message stated that the merger ordinance providing for the consolidation of the Home and the Bell companies had not been presented to government authorities on account of the controversy between the local companies and the Kinloch company of St. Louis.

Mr. Adams announces, however, that the Kinloch company, which protested against the consolidation, has withdrawn its motion asking the Missouri public service commission to block the merger. City officials and others familiar with the situation, state that Kansas City is fortunate in escaping increased rates about to become effective throughout the country.

Telephone Patents Recently Issued

A Brief Digest of Those Current Specifications Most Interesting

BY DAVID S. HULFISH

No. 1,291,766. Supervisory Signal System. Issued to H. P. Clausen, assignor to Western Electric Company, Inc., New York, N. Y. Each cord pair upon a manual switchboard has its customary lamp signals, and an additional signal is provided to all cord pairs, but connected with only one cord pair at any time, the connection being controlled by a step-by-step switch which responds automatically to a condition in the cord pair requiring the auxiliary signal.

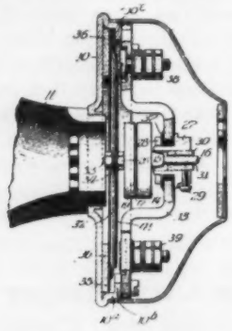
1,291,894. Registering System. Issued to H. Hovland, assignor to Western Electric Company, Inc., New York, N. Y. In an automatic exchange, impulses from the callsender are received by counting relays, in connection with switches which ultimately set up a connection in accordance with the call as registered by the relays.

1,291,911. Transmitter. Issued to Arthur Robert Kahl, Withington, Manchester, England. The front plate of the case is of sheet metal. Inside the front plate is a heavy ring, preferably of lead. The diaphragm has an edge turned toward this ring, and is pressed against the ring by tension through the carbon cell, but is insulated from the metal ring by a thin ring of insulating material.

1,291,950. Impulse Repeater. Issued to W. A. Long, assignor to Automatic Electric Company, Chicago, Ill. At the first selector, the impulses received from the call sender are repeated into the trunk circuit, the repeater being such that impulses of uniform length are given upon the trunk. The inductive kick of a coil is used in the diagram shown in the patent.

1,291,960. Number Indicating System. Issued to A. E. Lundell, assignor to Western Electric Company, Inc., New York, N. Y. At a manual B-board, the called number is sent over the trunk by impulses, which are recorded upon indicators to show the number to be connected and rung by the B-operator.

1,291,990. Rotary Connector System. Issued to T. G. Martin, assignor to Automatic Electric Company, Chicago, Ill. (Application filed October 11, 1909.) Where a subscriber has more than one line, as in the case of a private branch exchange, the



1,291,911.

connector will search in this system until the first idle line is found, connecting then with that line.

1,292,465. Connector Operating Mechanism. Issued to H. E. Hershey, assignor to Automatic Electric Company, Chicago, Ill. In connectors of the Strowger type, mechanism for moving the brushes is common to several connectors and is disconnected from the connector when the called party answers.

1,292,499. Ringing System. Issued to T. G. Martin and E. Jacobsen, assignors to Automatic Electric Company, Chicago, Ill. A generator of ringing currents is not used. The called line is rung upon by a pole-changer relay which rapidly reverses the battery upon the line.

1,292,815. Vibratory Ringing Generator. Issued to O. M. Leich, assignor to Leich Electric Company, Genoa, Ill. In the convertor, a rapid alternating current passed through a pair of vibrators and is changed to unidirectional current, then passed through a slow vibrator and is changed to slow alternating current for ringing use. This patent has to do with the provision of safeguards against possible shortcircuits within the machine, should it be unskillfully adjusted or otherwise abused.

1,292,827. Trunking System. Issued to F. Lubberger, assignor to Automatic Electric Company, Chicago, Ill. (Application filed June 19, 1909.) A repeating mechanism for the impulses at a selector is arranged to respond properly for passing the call through several exchanges in a multi-office system, the lines connected with having either common battery or local battery telephones.

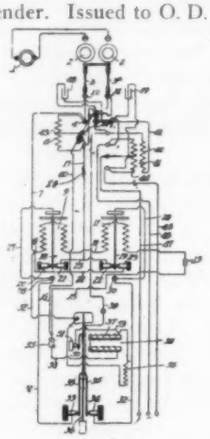
1,292,828. Semi-Automatic Trunk. Issued to A. E. Lundell, assignor to Western Electric Company, Inc., New York, N. Y. In the circuits of a trunk between manual offices, where the trunk is selected by automatic switches, a signal before the B-operator is displayed when the trunk is seized; provision is made to prevent the signal from being displayed a second time in case the B-operator is first to disconnect.

1,293,545. Call Sender. Issued to O. E. Rasmussen, assignor to Western Electric Company, Inc., New York, N. Y. This call sender is of the finger-hole type, with a circular dial which does not run back to send the impulses. When the dial is pulled down, the impulses begin and the dial is held in such position that the figures can not be seen through the holes of the dial until after the impulses have been sent to the central office.

1,293,597. Line Switch System. Issued to B. D. Willis, assignor to Automatic Electric Company, Chicago, Ill. In a Keith line unit, when several subscribers lift their receivers during the period when the plungers are being moved to new trunks, a modification is introduced to permit them to seize trunks one at a time, so that two or more do not seize the same trunk.

1,293,630. Automatic Switch Control. Issued to G. Deakin, assignor to Western Electric Company, Inc., New York, N. Y. The brush in this automatic switch moves until it strikes a mechanical stop; the mechanical stop is controlled in position by the callsender.

1,294,095. Call Sender. Issued to O. D. M. Guthe, assignor to



1,292,815.

Western Electric Company, New York, N. Y. In an impulse sender, keys are depressed to indicate the number to be called, and the number is sent by the running down of a train of gears. A certain number of keys must be depressed before the gears start.

1,294,111. Listening System. Issued to C. W. Keckler, assignor to Western Electric Company, Inc., New York, N. Y. In an operator's keyboard, the operator can not listen upon two connections at the same time, because the operation of two listening keys at the same time will put a short circuit upon her telephone.

1,294,285. Calling System. Issued to G. W. Lorimer and J. H. Lorimer, assignors to Western Electric Company, Inc., New York, N. Y. (Application filed November 26, 1901.) In an automatic exchange, where a subscriber is trying to send a call and while so trying is seized by a connector before his line is picked up by a linefinder switch, an interference is provided preventing the ring upon the line.

1,294,587. Linefinder System. Issued to S. B. Williams, Jr., assignor to Western Electric Company, Inc., New York, N. Y. The lines are not provided with relays, but a common line relay

is connected to them for test in rapid succession. When a calling line is found, a locking relay is charged and locked, and this locking relay starts a linefinder switch to pick up the calling line.

Reissue 14,593. Method of Locating Transpositions. Issued to H. Mouradian, assigner to American Telephone and Telegraph Company, Boston, Mass. The method of transposition does not require transpositions at regular intervals, but measures the correction required and then determines the point of transposition to provide that correction.

Public Utility Commission News

Reports Concerning the Activities of State Regulating Bodies

CHARLES E. ELMQUIST, president of the National Association of Railway and Utilities Commissioners, attacked Postmaster General Burleson in a statement issued in connection with the rate cases presented to the United States Supreme Court May 5. Asserting that the return of cable companies to private control next month will be a step in the right direction, Mr. Elmquist says it is far more important to remove government control of the telephone and telegraph companies. "The increased rates," he says, "were made by Burleson fully two and one-half months after the armistice was signed. Naturally the companies will attempt to retain the higher rates upon return to private ownership and thus Burleson has placed the whole burden upon the public."

Georgia

Acting on authority conferred by Postmaster General Burleson, the Southern Bell and the Cumberland Telephone Companies filed schedules increasing local telephone rates, effective May 1 in all the territory served by these two companies. The Southern Bell operates in Georgia, North lina, South Carolina, Florida and Alabama, and the Cumberland in Mississippi, Louisiana, Tennessee, Kentucky and parts of Indiana and Illinois.

The new schedule as filed with the Georgia railroad commission will have the effect of an average increase over present local rates in Georgia of about 14 per cent, it was estimated by an official of the Southern Bell Company, will in many instances lower the rates on residence telephones in Atlanta, and will increase the rates in the city's business section.

Illinois

The Public Utilities Commission entered an order of agreement between the Mann Telephone Company of Macomb and the Farmers' Bushnell Association of Bushnell, providing for the transfer of the telephone circuit served at present by the exchange to the Farmers Bushnell Telephone Association to be exchanged, and operated as the property of the Mann Telephone Company of Bushnell to make favorable conditions for the subscribers of Farmers Bushnell Telephone Association and the long distance telephone connection, now available for the subscribers of the Mann Telephone Company.

In a complaint filed before the commission the LaHarpe Telephone Company charges interference with its line by the Brooks Light and Power Company. The complaint alleges that since the power wire was strung service of the telephone company is almost impossible.

The commission fixed new rates to be charged by the Macoupin County Telephone Company for Carlinville and vicinity. In adjusting the rates the commission permanently suspends the schedule of rates offered by the company and substitutes one agreed upon by the commission.

The order directs that a discount of twenty-five cents a month shall be allowed by the company on all bills paid before the fifteenth of each month. The new schedule follows:

Individual line business telephone, per annum, $39.

Party line business telephone, per annum, $33.

Individual line residence telephone, per annum, $27.

Two-party line residence telephone (desk), per annum, $24.

Two-party line residence telephone (wall), per annum, $21.

Four-party line residence desk telephone, per annum, $21.

Four-party line residence wall telephone, per annum, $18.

Party line rural telephone, per annum, $18.

Churches, hospitals, schools and other charitable and educational institutions, same rates as residence telephones.

Business extensions, $9.

Residence extensions, $6.

Extension bells, $1.80.

Listing extra name in directors, $6.

Private line business or residence telephone for each one-half mile and major fraction thereof beyond the established exchange area, in addition to above rates, $6.

Telephones for use of city, not exceeding five in number required by ordinance granting franchises free.

In case bills for individual line or party line business or residence telephones shall be paid at the office of the company on or before the fifteenth day of the month in which the service is rendered, a discount of twenty-five cents per month from the foregoing rates applies. In case bills for party line rural telephones shall be paid at the office of the company on or before the fifteenth day of the second month of the quarter in which the service is rendered, a discount of twenty-five cents per month from the foregoing rates applies.

Bills for city telephone service subject to discount if payment is made on or before a specified time, will be rendered at the beginning of the period during which the service is furnished.

Minier Mutual Telephone Company. In the matter of proposed advances in rates for telephone service in Mackinaw and Minier, Tazewell County, and Stanford, McLean County, and vicinities. Resuspended until October 30, 1919.

Mt. Sterling Telephone Company. In the matter of the proposed advances in rates for telephone service in Mt. Sterling, Whiteside County, and vicinity. Suspended to August 2, 1919.

In the matter of joint application of the Sullivan Home Telephone Company of Sullivan, Moultrie County, and the Arthur Mutual Telephone Company of Arthur, Moultrie County, for an order authorizing Arthur Mutual Telephone Company to sell, and Sullivan Home Telephone Company to purchase certain telephone toll circuits, and consenting to and approving of an intercorporate contract. Order author-

izing above purchase and sale upon the conditions set forth in order.

Knoxville Farmers' Telephone Company. In the matter of proposed advances of rates for telephone service in Knoxvill, Ill., and vicinity suspended until September 8, 1919.

Stark County Telephone Company. In the matter of proposed advances in rates for telephone service in Toulon, Wyoming, Elmira, Castleton, Duncan, County of Stark, and vicinities, and Camp Grove, County of Marshal, and vicinity. Order vacating as of April 30, 1919, rate schedule I. P. U. C. 1 of Stark County Telephone Company and authorizing discontinuance of rates now in effect in Toulon, Wyoming, Elmira, Castleton, Duncan, Camp Grove and vicinities, and substitution therefor of the following schedule:

Twenty-four-hour service maintained at these exchanges.
Individual line business stations, $24.
Individual line residence stations, $21.
Four-party line residence stations, $18.
Rural multi-party line stations, $18.
Extension telephone complete, $6.
Sixteen-hour service maintained at these exchanges:
Individual line bhsiness stations, $22.80.
Individual line residence stations, $19.80.
Four-party line residence stations, $18.
Rural multi-party line stations, $16.80.
Extension telephone complete, $6.

Rentals are payable monthly in advance, and if paid at the office of the company on or before the fifteenth day of the current month a discount of 25 cents per month is allowed.

Rentals for rural telephones are payable quarterly in advance, and if paid on or before the fifteenth day of the middle month of the current quarter, a discount of 25 cents per month will be allowed.

Indiana

The public service commission issued an order in which it rejected the new and increased telephone rates proposed for thirty Southern Indiana cities or towns by the Southern Telephone Company of Indiana.

By order of the commission the Noblesville Home Telephone Company charges the following rates, beginning May 1, 1919. Subscribers will be required to pay their telephone rental at the office of the company on or before the fifteenth of the current month. If paid on or before the fifteenth day of said month 15 cents per month will be deducted from the gross rate.

Rates as follows:

Single line business; gross $1.90 per month. Net $1.75.
Two-party line business, gross $1.65 per month. Net $1.50.
Single line residence, gross $1.65 per month. Net $1.50.
Two-party line residence; gross $1.40 per month. Net $1.25.
Four-party line residence; gross $1.15 per month. Net $1.00.

Rural or farmers party lines will be required to pay by the quarter on or before the fifteenth day of the second month in the quarter. Gross $3.45. Net $3.00.

The commission has given the Papaz and Lakeville Home Telephone Company authority to increase its rates on both business and residence telephones.

The rates per month of a telephone utility were increased as follows: Business telephones, from $1.00 to $1.50; residence town telephones, from $1.00 to $1.25; rural party telephones, from $1.00 to $1.25 net.

Gross and net rates were provided, the net rate to be charged if bills are paid on or before the fifteenth of the month, or the eighteenth of the second month of the quarter, in which service is rendered.

A value of $22,958 was placed on the property of the company.

Rates were fixed for a telephone utility estimated to yield a return of six per cent.

A telephone utility was ordered to set aside annually, for depreciation five per cent of the value of its depreciable property including the value of future additions, extensions and betterments and rules were provided for its depreciation fund.

The Monticello Telephone Company has been ordered to raise its rates as follows: $2.10 per month for business telephones with a rebate of ten cents if paid by the fifteenth of the month following and $1.45 for residence telephones with the same rebate. The commission also advised the company to collect these rates in advance and according to government regulations a fee of $3.50 will be charged for installing a telephone.

The Vigo Mutual Telephone Company has petitioned the Public Service Commission for permission to increase its rates from $12 to $15 a year.

Kansas

The state public utilities has offered a counter proposal in the telephone rate case. If the Southwestern Bell will file an application for rate advance, it will dismiss its present injunction suit and will investigate the need of the additional revenue to meet pay roll increases. If it is shown that all of the money asked is used for wage increases, then an increase in rates will be allowed.

Following the application of telephone employees for a higher rate schedule for the telephone company, the commission took the position that the increase in rates should be asked only in case there was no money available.

The LaCrosse Home Telephone Company is authorized to file an amended schedule of rates effective on and after May 1, 1919, providing charges for the various classes of service furnished by it at and through its exchange at La Crosse, Kansas, as follows, to-wit:

Individual line business telephone, $1.75 per month.
Individual line city residence telephone, $1.25 per month.
Rural switching service (all equipment owned and maintained by subscribers to city limits) per telephone, 35 cents per month.
Desk sets, extra, (Business and Residence), 25 cents per month.
Rural telephones to furnish own batteries.
All other rates to remain as are now in force.

Nebraska

Telephone companies in Nebraska that have been declaring dividends in excess of 8 per cent are to be haled before the state railway commission and ordered to show cause why they shall be allowed to continue, under the policy of regulation, to earn such large returns. This is the policy of the commission, as announced from its office.

The first company to fall under the rod is the Buchard Telephone Company, which has been declaring and paying

dividends for the last eight years ranging from 16 to 40 per cent, the latter having been paid the last two years.

The application of the Nebraska Telephone Company to the commission for an indefinite extension of time of the emergency war rate on exchange and tolls service was partially allowed in that the application was granted to December 31, 1919. The application for a raise in the exchange rate was also granted which will be an increase of about 50 cents per phone.

The Lincoln company was also granted its application for extension of time to the same date. The company asked for a six months' extension, but did not ask for a raise in rates. In the case of both companies the time for the emergency rate was about to expire and if the application had not been granted the rate before the war would have gone into effect.

Ohio

When the Ohio Public Utilities Commission announced the merger of the Bell and Hillsboro Home telephones it also fixed the charge for rentals which is to be as follows:

Rural residences, all party lines $1.50.

Residences in Hillsboro, individual lines $2.50.

Residences in Hillsboro, party lines $1.75.

Business houses in Hillsboro, individual lines, $3.00.

Under a ruling of the state utilities commission the Warren company has been authorized to increase its rates beginning June first. The increase is 50 cents a month for one party lines and 25 cents a month for five party lines. A 25-cent raise is made on business extension telephones.

The commission granted permission to the North Ridge Telephone Company, Lorain county, to sell $2,000 in capital stock to pay for a new exchange building. The Grafton Telephone Company, Lorain county, was granted the right to issue $2,280 in stock to pay for in exchange building.

The commission, authorized the Athens Home Telephone Company to purchase the Athens property of the Bell Telephone Company. The commission fixed the rates at $39 a year and party lines at $30. A stock issue of $34,000 was authorized to pay for the purchase.

Oregon

The state public service commission denied the application of the Pacific Telephone & Telegraph Company for a general revision of telephone exchange rates.

Increases in rates, however, were allowed by the commission for all business telephones operated by this company in the state, and increases were allowed in rates for residence telephones at Albany, Corvalis, Oregon City and Grants Pass.

Increases in the rates for business telephones range from $1.50 per telephone in Portland down to 25 cents or other slight increase in smaller towns and cities.

Increases allowed by the commission are intended to be sufficient to take care of the increases in wages and abnormal cost of materials, but not to give any increase in profits on the company's investment. The increases in rates allowed by the commission are to be effective for one year only, unless at that time the commission extends them.

Oklahoma

Sweeping revision of telephone rates in Oklahoma, for both long distance and exchange service, will follow return of the wire companies to private ownership.

When Burleson's control of the wire ceases, it is understood, the commission will begin a thorough investigation of rates and service with the view of issuing orders placing rates back on a pre-war schedule, and demanding service commensurate with the charges demanded by the companies.

Minnesota

The Hector Telephone Exchange Company is authorized to place in effect, as of July 1, 1919, the following schedule of rates for local and rural telephone service at Hactor, Minnesota:

Individual Line Business	$2.50	per	mo.	gross
Individual Line Residence	1.50	"	"	"
Rural Multi-party	1.50	"	"	"
Business and Residence Extensions	.50	"	"	net
Extension Bell	.15	"	"	"

All rates to be billed gross except where quoted net. All gross rates to be payable monthly in advance, with a discount of 25 cents per month if paid on or before the 15th of the month in which the service is rendered, except that rural multi-party rates are payable quarterly in advance, with a discount of 75 cents if paid on or before the 15th of the first month of the quarter; 50 cents if paid on or before the 15th of the second month of the quarter, and 25 cents if paid on or before the 15th of the third month of the quarter.

The Red River Valley Telephone Company is authorized to place in effect the following schedule of rates for local and rural telephone service at Climax, Minnesota:

Individual Line Business	$1.50	per	month
Two-party Line Business	1.25	"	"
Individual Line Residence	1.25	"	"
Two-party Line Residence	1.00	"	"
Rural Multi-party (company owned)	1.25	"	"

The Harmony Telephone Exchange Company is authorized to place in effect the following schedule of rates for local and rural telephone service:

Individual Line Business	$1.25	per	month
Individual Line Residence	.85	"	"
Rural Switching	2.00	"	year

The Watkins Telephone Company is authorized to place in effect as of June 1, 1919, the following schedule of rates for local and rural telephone service at Watkins, Minnesota:

Individual Line Business	$2.00	per	month
Individual Line Residence	1.25	"	"
Rural Multi-party	1.25	"	"

The Akeley Telephone Company is authorized to place in effect, as of June 1, 1919, the following schedule of rates for local and rural telephone service at Akeley, Minnesota:

Individual Line Business	$2.75	per	month	gross
Individual Line Residence	1.75	"	"	"
Business Extensions	.50	"	"	net
Residence Extensions	.25	"	"	"
Multi-party Rural	1.50	"	"	gross
Rural Switching	3.60	"	annum	net

All rates to be billed gross except where quoted net. All gross rates to be payable monthly in advance, with a discount of 25 cents per month if paid on or before the 15th of the month in which the service is rendered, excepting rural switching rates which are payable annually in advance, and except that multi-party rural rates are payable quarterly, with a discount of 75 cents if paid on or before the 15th of the first month of the quarter; a discount of 50 cents if paid on or before the 15th of the second month of the quar-

ter, and a discount of 25 cents if paid on or before the 15th of the third month of the quarter.

It is ordered, that the company immediately make such repairs to its rural lines as to render to its rural subscribers a reasonable telephone service.

The McLeod County Telephone Company is authorized to place in effect, as of June 1, 1919, the following schedule of rates for local and rural telephone service:

CITY OF GLENCOE

Individual Line Business	$2.50	per	month	gross
Two-party Line Business	2.25	"	"	"
Individual Line Residence	1.75	"	"	"
Two-party Line Residence	1.50	"	"	"
Extension telephones	.50	"	"	net
Extension bells	.25	"	"	"

VILLAGES OF LESTER PRAIRIE, SILVER LAKE AND BROWNTON.

Individual Line Business	$2.00	per	month	gross
Individual Line Residence	1.50	"	"	"
Extension telephones	.50	"	"	net
Extension bells	.25	"	"	"

ON ALL RURAL LINES OPERATED IN CONNECTION WITH THE ABOVE EXCHANGES

Rural Multi-party, grounded lines	$18.00	per	year	gross
Rural Multi-party, metallic lines	21.00	"	"	"
Extension bells	3.00	"	"	net

A discount of 25 cents per month to be allowed on all gross city and village rates if payment is made on or before the 10th day of the month following the month in which the service is rendered except that multi-party rural rates are payable quarterly in advance, with a discount of 75 cents if paid during the first month of the quarter; a discount of 50 cents if paid during the second month of the quarter, and a discount of 25 cents if paid during the third month of the quarter.

The Hewitt Telephone Exchange Company is hereby authorized to place in effect, as of June 1, 1919, the following schedule of rates for local and rural telephone service at Hewitt, Minnesota:

Individual Line Business	$2.50	per	month	gross
Individual Line Residence	1.75	"	"	"
Two-party Line Residence	1.50	"	"	"
Rural Multi-party	1.50	"	"	"
Rural Switching	.30	"	"	net
Business Extensions	.75	"	"	"
Residence Extensions	.50	"	"	"
Extension Bells	.15	"	"	"

All rates to be billed gross except where quoted net. An allowance of 25 cents per month to be made on all gross rates where the bill is paid on or before the 15th of the month in which the service is rendered.

The Effington Telephone Company is permitted to purchase the physical property of the Parkers Prairie Telephone Exchange Company, at Parkers Prairie, Minnesota, same to be effective July 1, 1919.

Application of the Northwestern-Minnesota Telephone Company to increase its local and rural telephone rates at Strandquist and Karlstad will be heard at the Village hall, in the village of Strandquist, Minnesota, at 10:00 a. m., June 5.

Wisconsin

Increases of 50 cents per month for business telephones and 25 cents per month for residence telephones are granted the La Crosse Telephone Company in a decision handed down by the Railroad Commission of Wisconsin. The ruling applies both to the La Crosse and Onalaska exchanges. The new rates go into effect June 1.

The raise in rates is coincident with the purchase by the La Crosse Telephone Company of the business of the Wisconsin Telephone Company in this city. Increased operating expenses amounting to over $15,000 per year prompted the railroad commission to grant the petition of the company for a raise in rates. Since January 1 the company has expended $20,000 for the building addition, $20,000 for equipment and paid $34,000 to the Wisconsin Telephone Company.

No four party service in Onalaska.

Business rates:

1 party business, per month, $3.75, and if paid during current month, $3.50.

2 party business, per month, $3.25, and if paid during current month, $3.00.

4 party business, per month, $2.75, and if paid during current month, $2.50.

Residence rates:

1 party residence, per month, $2.50, and if paid during current month, $2.25.

2 party residence, per month, $2.00, and if paid during current month, $1.75.

4 party residence, desk, per month, $1.75, and if paid during current month, $1.50.

4 party residence, wall, per month, $1.50, and if paid during current month, $1.25.

Rural rates:

Rural rates on lines in territory marked "A" on attached blue print $5.25 per quarter. 75 cents discount is allowed if paid during first month of quarter, 50 cents discount is allowed if paid during second month of quarter, and 25 cents discount is allowed if paid during third month of quarter.

Kansas Men Meet June 5

Six hundred men representing the 450 independent telephone interests of Kansas will be in Topeka June 5 and 6 to attend the annual convention of the Kansas Independent Telephone Association. Reconstruction problems, government ownership and the increased cost of operation will be the principle topics of discussion. Speakers of national reputation will address the assembly.

The high price of material, the labor situation and prevailing low rates as opposed to the increase in the price of everything elese is proving a serious embarrassment to the telephone companies, according to L. M. Kraege, secretary of the association.

Central Illinois Men Meet

The session of twenty-five owners of telephone companies, members of the Central Illinois Telephone Association closed May 16 at the toll clearing rooms in Springfield. Plans were made for a publicity campaign to acquaint the patrons of the telephone with the problems of the managers. Discussion of government orders was also held. The meeting was presided over by President B. M. Burke, Carlinville, and the secretary is F. M. Bowles, Cerro Gordo.

The opening address was made by President E. B. Glandon of the Illinois Telephone Association, of Pittsfield, who talked on the subject, "Government Control and Legislation." A dinner was held at the St. Nicholas hotel. J. G. Mitchell, telephone engineer of the utilities commission, spoke.

Of Interest to the Trade

A Skinderviken Movie

It is announced that the Skinderviken Telephone Equipment Company has had prepared a one-reel motion picture study of the development of the Skinderviken transmitter button and coincidentally, that of the company. A very interesting scenario has been built around the company's history.

The film was produced under the personal direction of Frederick J. Ireland, director general of the Emerald Motion Picture Company, Chicago, thus insuring the best quality entertainment.

Stromberg-Carlson Secures Big Contract from Far East

A cablegram received a few days ago brings word to the Stromberg-Carlson Telephone Manufacturing Company that it has been awarded a contract for furnishing a complete telephone exchange equipment for the West office of the Shanghai Mutual Telephone Company, Ltd., of Shanghai, China.

Officials of the Stromberg-Carlson Company say that the switchboard to be manufactured under the terms of this contract will be one of the largest installations of its kind. It will be built in sections which, when joined together, will have an aggregate length of approximately one hundred and ten feet. The switchboard will be arranged for an ultimate capacity for handling ten thousand lines and when installed will require the service of forty operators to care for the initial equipment.

The contract includes, in addition to the main switchboard, a large storage battery installation, battery charging machinery, power switchboards, terminal frames and protector equipment, also separate desk switchboards for information operator, chief operator and the wire chief.

The present order practically duplicates an installation made by the Stromberg-Carlson Company in the North office in Shanghai two years ago. The fact that the first installation has given excellent service under the severe climatic conditions encountered in that section of the tropics, is said to have been an important factor in the award of the contract to the Rochester firm over practically all other telephone manufacturers both in the United States and abroad.

Hand Mixing of Concrete Thing of Past

"You would surely be surprised to know the number of telephone companies that are using concrete mixers," remarked J. W. Wooley, sales manager of the Oshkosh (Wis.) Manufacturing Company, recently.

"For years many telephone companies did all of their concrete mixing by hand and it is only during the last few years that they have thoroughly realized just how costly this is compared to doing the work with a good concrete mixer. Now, however, that they are fully awake to the possibilities in this sort of work, scores of companies all over the country are buying mixers and doing away with hand mixing entirely. This seems to be particularly true this year as we have already sold more mixers to telephone companies than ever before in our history.

"There are many uses to which a mixer can be put in telephone work. Take pole setting. It is now considered the best practice to set telephone poles in concrete and many telephone companies will not consider setting poles in any other way—the poles last much longer, in fact, many times longer, and it does away with a great deal of the trouble from frost heaving, and fallen poles, due to high winds. It's pretty hard to uproot a pole set in concrete. If this work is done by hand it is a long, tedious job, a job that it is very hard to get workmen to do in these days and it becomes pretty costly, too, when compared to what the same work would cost when done by machin-

Great Switchboard Installed by the Stromberg-Carlson Telephone Manufacturing Company in the North Office at Shanghai, China, to be Duplicated in the West Office.

ery. Put a concrete mixer on the job and it does away with the whole concrete gang. For instance, with our little Eveready Mixer two men can operate the machine and do all of the mixing work. It would take ten or twelve to do the same amount of work by hand.

"Then there is conduit work. Using a concrete mixer on this kind of work cuts the labor cost fully fifty per cent and in many cases much more than that.

"Man-hole work is another type of work to which a concrete mixer is admirably adapted.

"There are dozens of concrete mixers on the market now that are adapted to telephone work very nicely. The little Eveready Mixer is just the right size to take care of this type of concrete mixing, economically. It turns out thirty-five to fifty cubic yards in an eight-hour day and has a batch capacity of four cubic feet. The mixing drum can be discharged automatically right into the forms or into a wheelbarrow. Since it will turn out a perfectly mixed batch in forty seconds, it will keep several men busy wheeling the mixed concrete where there is a big job to be done and still is small enough to be operated by a two-man gang on other work.

"The Eveready is readily portable as it weighs only 1,500 pounds and is mounted on a substantial truck. This makes it a very handy machine for the pole setting gang to handle as it can be moved from hole to hole just as fast as the poles are ready to set and there is never any time lost in moving.

"When we designed this machine particular attention was paid to the engine, for we realized that an expert engine man would not always be on the job in case something went wrong, so the engine was made just as simple as possible. Any ordinary workman can operate it and make all the adjustments necessary.

"With such simple and satisfactory mixers as this on the market," concluded Mr. Wooley, "we feel sure that it will be but a short time till every telephone company in the country will be using power mixers for their concrete work."

Extension of Italian System

Steps are now being taken by the Italian government to remedy the deficiency which has long existed in the matter of telephone facilities. The minister of Posts and Telegraphs has just authorized the provincial governments, provided they have 70 per cent of communes unprovided with telephone service, to issue bonds jointly with the communes and also with districts having a population of not less than 1,000. These bonds will mature in 25 years, and under certain circumstances also in 50 years. The circular authorizing the above issues emphasizes the degree to which the burden of administration will be lightened by telephone communication between the provincial and communal governments.

The following figures indicate the number of telephones in the different European countries per 100 inhabitants; Norway, 3.40; Switzerland, 2.22; Germany, 2.10; Great Britain, 1.70; France, 0.80; Austria, 0.60; Italy, 0.26.

Kingsbury on Rates

Further increases in telephone rates throughout the country will be necessary, in the opinion of N. C. Kingsbury, vice-president of the A. T. & T. Co.

New Method of Applying Varnish to Telephone Cabinets

While there may be "nothing new under the sun," the Kellogg Switchboard and Supply Company believes that there are a great many new and better ways of doing things as yet undiscovered and the most successful manufacturer is the man who develops these new ways and does it first.

The Kellogg company has developed several improvements in the applying of its well known finishes to switchboards and telephone cabinets.

Years ago shellac and varnish were put on with old style brushes by hand and no matter how carefully this was done, some parts of the wood surface received more varnish than others. The modern commercial artist showed the way for a vast improvement in cabinet finishing by the use of his air brush, which enables him to produce on bristol board, photographic papers and canvas, the beautiful and novel coloring effects now so necessary in all commercial art work.

The artist's air brush is nothing more or less than

How Varnish is sprayed on in the Kellogg Factory

a modified orchard sprayer, although as a matter of fact, the use of the air brush probably ante-dates the familiar bug-killer now to be found on every large farm. Today, the commercial artist, instead of tedious and sometimes ineffectual application of colors by means of a camel's hair brush, holds in his hand an apparatus which looks like a cross between a doctor's syringe and a pineapple-eye remover.

To this apparatus is attached a rubber tube from a pressure tank. This syringe-like tube held in the artist's hand contains a receptacle for ink and by the use of a lever operated by the fingers the air pressure forces the color in a delicate spray of infinite fineness onto the paper or photograph. In the skilled hand of the artist, the wonderful shadings possible in modern commercial illustrating, and photographic retouching, are brought about.

So now in the Kellogg factory are seen air brush artists. Although they operate a somewhat different style of air brush, the principle is the same. The accompanying illustration shows one of the company's operators putting one of the many coats of high grade varnish on a Kellogg Switchboard, and by means of this air brush, similar in principle to the artist's tool, the finisher sprays the varnish into the surface of the wood as well as on it and with a degree of uniformity and thoroughness impossible with old methods. Each

operator stands before a covered frame which contains a revolving pedestal on which the switchboard cabinet or telephone box is placed and this revolving table allows the application of each coat of varnish evenly over every part of the cabinet without marring of finger or hand prints unavoidable in old-fashioned methods.

In several different departments of the Kellogg plant these varnish and enamel air brushes are now employed not only for the very thorough application of the best shellac and varnish—the application of which to all telephone boxes and switchboard cabinets, require over two weeks' time—but also in the application of Kellogg special black enamel which is so popular not only for desk stand bases, pillars, and capitals, but also on steel planished bell boxes, gongs, hook switches, and even the transmitter case itself.

How Blacksmith Shop Became Great Manufacturing Plant

Fifty years ago, when Wisconsin was in its infancy, the Oshkosh Manufacturing Company had its start in a blacksmith shop in the little logging town of Oshkosh, Wisconsin. This was in the days when the Wisconsin rivers were alive each spring with the great logging drives, when for days and weeks men worked feverishly night and day to bring those great twisted masses of logs safely to the mills; when a man was judged by his ability to handle a cant-hook, a peavey and a pike pole. They were strenuous days and the tools they used had to be of more than the ordinary timber.

Laboriously, in this little plant, cant hooks, peavies and other logging tools were beaten out with hammer and anvil—but they were tools to be proud of, tools that a riverman would trust his life with without question. It was the ambition of Elmer Leach, who was the founder of this now great manufacturing firm, to build tools that were not only good but better than anyone else made. His success was such that it was not long before Oshkosh logging tools were known for miles as the finest tools for this kind of work that could be had. As this reputation spread the demand for Oshkosh tools grew, as did the plant, until a lumberjack did not think he was properly equipped unless he had a cant-hook and a peavey made by Oshkosh. When the decline of the logging industry came in Wisconsin, Oshkosh logging tools were probably the best known logging tools in the world. Today, wherever logging is done, Oshkosh tools are considered standard.

With the growth of the telephone and telegraph industry, with characteristic foresight, the Oshkosh Manufacturing Company realized that here was an industry that had as great need for quality tools as did the logging business. Since that date the development of Oshkosh construction tools has been steady and in keeping with the great strides made in this line of work. As fast as a new tool was needed it was developed—and the old idea that Oshkosh tools must be better has been rigidly adhered to.

The line includes peavies, cant-hooks, carrying-hooks, pike poles, tamping bars, digging bars, spoons, shovels, etc.—everything that is needed in erecting a telephone line.

Today this firm stands out as the largest manufacturer of construction tools in the world. It is its boast that more than half the telephone, telegraph and electric lines in America have been built with Oshkosh construction tools.

In speaking of the features of Oshkosh tools, J. W. Wooley, sales manager of the Oshkosh Manufacturing Company, said, "We have always felt that the best tool that could be built is none too good. And we know that such tools are far cheaper in the end. The workman is better satisfied, he can do better work with a good tool, and the company gets more for its money than with cheaper made tools."

The New Local Rates

Detailed schedules of local rates established at various southern points by order of the postmaster general may be taken as at least approximate indications of a standardized list.

In Group 1, exchanges with not more than 50 subscribers, no changes are made.

In Group 2, exchanges having 50 to 300 subscribers, the present rates for one-party, two-party and five-party lines are: Business, $2.75, $2, $2.75; residences, $1.65, $1.40, $1.65. The new rates for the same service are: Business, $3, $2.50, $2; residences, $2, $1.50, $1.25.

In Group 3, exchanges having 300 to 500 subscribers the present rates are: Business, $2.75, $2, $2.75; residence, $1.65, $1.40, $1.65. New rates: Business, $3.25, $2.75, $2.25; residence, $2, $1.75, $1.25.

In Group 4, exchanges having from 500 to $1,000 subscribers, the present rates are: Business, $2.75, $2, $2.75; residence, $1.65, $1.40, $1.65. New rates: Business, $3.50, $3, $2.50; residence, $2, $1.75, $1.25.

In Group 5, exchanges having from 1,000 to 1,500 subscribers, present rates are: Business, $4, $3.50, $2.75; residence, $2, $1.50, $2. New rates: Business $4.50, $4, $3; residence, $2.25, $1.75, $1.50.

In Group 6, exchanges having from 1,500 to 2,500 subscribers, present rates are: Business, $4, $2.50, $2.75; residence, $2, $1.50, $2. New rates: Business, $4.50, $4, $3; residence, $2.50, $2, $1.50.

W. E. Helping Reconstruction

According to a report the Western Electric Company has received big orders in New York from the French government and from French municipalities for telephones, wire and similar apparatus to go into the reconstruction of French cities and towns. These contracts are of a sufficient magnitude to cause the makers of telephone instruments to increase their forces.

The Western Electric in Chicago, in common with other factories that were in munition work, has been doing a light business since the armistice. The return of the telephone and telegraph companies to private management will mean much to these concerns, as the government has not extended lines and has in some cases discouraged private building and connections.

Radio Patent Suits

A suit involving millions of dollars was started May 13 in the United States District court for the southern district of New York against the Western Electric Company by the International Radio Telegram Company of Pittsburgh for alleged infringement of its radio telephone patent rights.

Automatic's Invitation

"The 'New Era' Telephone Convention is well named and probably no firm in the telephone business is in a position to realize this better than ourselves," says N. P. Bartley, director of publicity of Automatic Electric Company.

"We touch the telephone operating field at every point—great city systems like St. Paul, Los Angeles, Lincoln and Indianapolis; smaller exchanges like Marion and Elyria, Ohio; Muskegon, Mich., and hundreds of others, and small towns serving only a hundred or so subscribers. We are in contact with both urban and rural operation, private exchange needs, and long distance systems.

"Never before have so many operating companies discussed their problems and requirements with us, and they all tell the same story. As H. A. Harris, our vice-president and sales manager, points out in the current issue of our publication, *Automatic Telephone*.

" 'The telephone industry in all its branches is facing a future which will be far different from what we have known in the past. It is a new world that lies ahead.

" 'When the present upward trend in wages began, some years ago, many men thought it was temporary; that when things returned to "normal," wages would drop back to the old levels, and they were not especially worried. The best informed business men today are convinced that wages will never go back to the former figures, that they are permanently higher, and that employers must find ways of helping their employes earn more, not engage in fights to force wages down.

" 'This can only be done by making their work more productive, by freeing them of mechanical, routine duties and finding machines to perform such tasks. To pay an operator who can handle at best only 1,500 calls, three dollars a day, whereas two years ago she received only one dollar and a half, benefits no one. It simply adds one more element to the high cost of living. By installing equipment which will reduce the labor charge from one girl for every 1,500 calls to one per 15,000, justifies higher wages and benefits the company, its employes and subscribers alike.

" 'A second factor in this "New Era" which telephony faces, is government regulation. The old "let-alone" policy is dead forever. Actual government operation is not regarded favorably in America. But the war has proved that between these two lies the course that is more popular today than ever before. "Regulation" is not a new thing in the utility field, but it is being applied in a new way.

" 'Some years ago a prominent telephone executive said: "Let me fix the 'operating costs' and I care not who makes the rates." At that time the public service commissions reasoned that if telephone service cost a certain amount, rates had to be sufficient to cover that cost. Today, the theory is beginning to be advanced that the public is entitled to service of a certain minimum quality, at certain maximum rates, and the companies must find ways of keeping within these limits. If a company's equipment is such as to enable it to make a profit, all is well. If not, the stockholders must pocket the loss by accepting smaller dividends.

" 'This change in attitude toward service is not restricted to business men in cities. It is felt by all subscribers, everywhere. It is especially noticeable among rural patrons, because rural lines have been the last to be improved.

" 'These are only a few of the conditions that face telephony as it enters upon the "New Era." They are realized and understood by all telephone men, who also know that the equipment which served during the old days is not able to meet the demands of today—much less tomorrow. They know that labor must be used more efficiently, or that operating costs will wipe out all profit. They know that quick, accurate service must be offered, and that the apparatus must be able to handle sudden emergencies—the telephone is too important to be put out of service by an armistice celebration or an influenza epidemic.

" 'The telephone men of America realize all these things and they also know that the automatic system is the "New Era" system—that it alone can meet the conditions which they are facing today, and which will become more acute each year.'

"We are planning a very complete and comprehensive exhibit at the national convention this year, for we expect it to be a large and representative gathering, and we feel that it is very important that we give these telephone men an adequate opportunity to study our apparatus, see it in operation, and discuss its features with those who are operating it in all parts of the counttry. We extend a most hearty invitation to all telephone men to visit our headquarters, suite 1708-9 and 10, at the Hotel La Salle, and we shall give them every assistance possible in studying this "New Era" telephone system, which has back of it over a quarter of a century of experience and success, and which fits so perfectly the requirements of today."

(*Concluded from page 214.*)

and best in their several lines. TELEPHONE ENGINEER will occupy Room 1757.

There will be something doing that will be worth while every minute from the time you register in until the convention adjourns.

This convention has been named the "New Era" Convention. Truly a new era in our industry is at hand. It therefore behooves every Independent telephone man who is interested in the future of the Industry to be on hand the dates of June 24, 25 and 26, 1919.

HOTEL ACCOMMODATIONS

It is urged, in order that all attending the convention may have suitable accommodations, that they send in request for reservation, either directly to the hotel at which they wish to stop, or to Secretary W. S. Vivian, 19 South La Salle street, for the accommodations desired so that proper reservation can be made and those making such reservation be assured of a place to stop while attending the convention.

Reservations covering requests sent to Secretary Vivian will be made at Hotel La Salle unless otherwise specified.

Los Angeles Greets Signal Corps

The return of the Los Angeles men and women who served with the Army Signal Corps was officially celebrated the night of May 16, when more than 2,000 persons attended the two receptions in their honor, given by the Southern California Telephone Company and the Pacific Telephone and Telegraph Company at the Y.M.C. A. and the Y.W.C.A. buildings.

Brevities of the Business

The Activities of the Whole Telephone Field Told in Short Paragraphs

PERSONAL NOTES.

L. G. LeBourveau, one of the old timers in the telephone business—better known as "Lee"—retired recently from his position as secretary and sales manager of the American Electric Company, Chicago. He has moved South to engage in the automobile accessory business, having offices in Atlanta, Ga., and Jacksonville, Fla. "Lee" was born in 1874 in Chicago near the section where the great telephone manufacturing industry grew up, but moved, when a lad, to Jacksonville, Fla., where he received his education and afterwards engaged in the electrical contracting business. He entered the telephone field in connection with the sale and installation of the Jacksonville Telephone Company's plant, was afterwards connected with the Georgia Telephone Company, Savannah, and had considerable experience in the operating field, installing several other plants; he traveled for five years in the interests of the Sumter Telephone Mfg. Co. introducing their product over a large territory and left them to accept a position with the Chicago Telephone Supply Company, of Elkhart, as sales manager; he afterwards organized the telephone department for the Ewing-Merkle Electric Company of St. Louis and had charge of their electrical exhibit at the St. Louis exhibition; in 1905 he assumed the position as sales manager for the Central Telephone and Electric Co., St. Louis, where he remained until 1910, leaving that position to assume the position as secretary and sales manager of the American Electric Company.

L. G. LeBourveau.

O. J. Huie has been appointed acting chief engineer of the southern group of Bell Telephone companies, with headquarters in Atlanta, to succeed George J. Yundt, recently elected second vice president of the companies. Mr. Huie has been associated with the Southern Bell Company for a number of years as outside plant engineer and has won constant and rapid promotion. He is a native Atlantan, having been born here in 1877. He graduated from Davidson college in 1901, was instructor at Georgia Tech for a year and entered the telephone service in 1902. He is a man of varied experience and recognized ability, who is popular with his associates and a leader in his profession. He is succeeded as outside plant engineer by T. H. Landraf, who came from Nashville, where he was division engineer.

R. J. Benzel of the offices of the Bell Telephone Company at St. Louis is to leave soon for Topeka, Kan., where he will succeed Edwin F. Carter as general manager of the Kansas District. Carter has been transferred to Texas and made general manager of the Texas district.

Edwin F. Carter, a former St. Louisan, who for some time has been general manager of the Bell Telephone Company's properties in Kansas, with headquarters at Topeka, has been transferred to Dallas, Tex., as general manager of the Texas properties, succeeding A. B. Elias, whose transfer to St. Louis as second vice president was announced recently. Carter is a Washington University graduate.

A. B. Elias of Dallas, Tex., has been chosen as second vice president of the Southwestern Bell Telephone Company, according to an announcement made recently by H. J. Pettengill, president of the Southwestern system. Elias, who is general manager of the Southwestern Telegraph and Telephone Company of Texas, succeeded Ben S. Read, who resigned to become president of the Mountain States Telephone and Telegraph Company, with headquarters in Denver. As second vice president of the system, Elias will be in charge of operation and have control of more than 20,000 employes. He is to assume his new duties immediately. Elias is 44 years old and was born in Springbrook, Pa. He first entered the telephone business in 1900 with the New York Telephone Company as a galvanometer tester. He soon became supervising foreman of splicers, and later a construction supervisor. He rose rapidly to his present position.

H. A. Barnhart, former representative in congress, has assumed active management of the Rochester Telephone Company, at Rochester, Ind., of which he is president and chief stockholder. An extension of service was also announced at the same time. Mr. Barnhart will devote a portion of his time to management of his farm.

William Van Pierce May, the genial, obliging owner and operator of the Hudson Telephone Company, at Hudson, Ill., died as the result of an apopletic stroke which occurred recently.

Frank X. Staub has been appointed as chief engineer of the entire properties of the Home Telephone Company at Fort Wayne, Ind., including all its exchanges and long distance lines.

J. E. Farnsworth, vice president of the Southwestern Telegraph and Telephone Company, announced recently the appointment of Joseph D. Frank of Dallas to be general attorney for the company in Texas. Mr. Frank has had considerable experience as an attorney for the company. He represented this company in Arkansas for nearly two years. He is a native Texan and received his degrees from the University of Texas in 1914.

Casper E. Yost, president of the Nebraska Telephone Company since 1890 and president of Bell companies in Iowa, Minnesota and the Dakotas, has retired to become chairman of the board of directors. W. B. T. Belt, vice president and general manager, will be named president. Guy H. Pratt, now general commercial superintendent, will become vice president. A. A. Lowman, now general superintendent of plant, will become vice president and general manager. These three officials will be elected to the same offices in the Iowa Telephone Company in Iowa and the Northwestern Telephone Company in Minnesota and the Dakotas.

C. N. Ware has resigned his position as superintendent of the office of the Western Union at Bellaire, Ohio, and taken one as wire chief of the Bell Telephone Company at Cambridge.

H. R. Mason, district manager of the Michigan State Telephone Company's interests in Saginaw for a number of years, has resigned his position and will join the sales staff of the General Motors Company, Buick division. Mr. Mason is one of the veterans of the telephone field in Michigan.

Walker Treat Walker has been appointed manager of the Buffalo office of the Western Electric Company. Mr. Walker came with the Western Electric in 1906 and in 1909 took charge of power apparatus sales in the New York office. During the war he served as first lieutenant in the Signal Corps, U. S. A. On his discharge from the service he was appointed manager of the Newark office, in February, 1919. He is now manager of the Buffalo house.

Gregory Brown has been appointed manager of the Newark house of the Western Electric Company to succeed Mr. Walker. Mr. Brown came with the company in 1905 as a member of the engineering department. He joined the general telephone sales organization in 1911 and became acting assistant manager of the Cincinnati office in 1914. In 1916 he came to the New York house as supply specialist, remaining there until his appointment to the managership of the Newark office.

The death of William F. Kehres, 63, for twenty-five years postmaster at Warrensville, Ohio, and founder of the Warrensville Telephone Company, occurred recently at his home there. Until the Bell Telephone Company in 1901 bought out the present Warrensville branch. Mr. Kehres was president of the company he founded. He is survived by his widow and four children.

H. J. Pettengill of St. Louis, president of the Southwestern Telegraph and Telephone Company, became president of the Dallas Telephone Company, Dallas, Texas, at the meeting of directors at the Adolphus Hotel. Royal A. Ferris of Dallas retired from the presidency and was elected chairman of the executive committee.

First Lieutenant Harry M. Woodward, formerly of the 115th Field Artillery, who was transferred to the regular army and left in France when his regiment sailed for home, has been placed in charge of a telephone line running from Le Mans to Paris. Lieutenant Woodward was the signal officer of the regiment under Colonel Berry, and was cited on several occasions for bravery in action. Lieutenant Woodward was formerly connected with the engineering department of the Cumberland Tele-

phone Company in Nashville under the division engineer, T. H. Landgraf.

Leaving the position of district manager for the Michigan State Telephone interests in Saginaw which he has occupied for many years, H. R. Mason will shortly join the Buick division of the General Motors Company.

R. B. Gallup, who has been engaged for some time on special work in the engineering and appraisal departments of the Home Telephone and Telegraph Company at Fort Wayne, Ind., has been appointed to the position of purchasing agent of the company, a position which has assumed new importance since the appropriation of the sum of $50,000 by the company to be devoted largely to the internal improvements of the company's equipment. Mr. Gallup's services in the new relationship—which will not mean an entire abandonment of his work in the engineering department—became effective May 1. Mr. Gallup has been connected with The Home Telephone and Telegraph Company during the past eight years. He came to Fort Wayne from a period of experience with the Inter-State Telephone and Telegraph Company of Aurora, Ill., and has been one of the most efficient men in the service of the Fort Wayne company.

H. C. Gordy is the name of the new manager of the Central Union Telephone Company at Canton, Ill.

A. G. Goehring, manager for several years in Centralia and Chehalis, Washington, of the Pacific Telephone & Telegraph Company, has tendered his resignation and will open a boys' clothing store. His successor has not yet been named by the telephone company.

After 19 years' service, more than five years of which have been as manager of the Wisconsin Telephone Company's exchange at Superior, Wis. W. F. Hallfrisch has tendered his resignation to that company to assume the management of an electrical appliance and fixtures shop which the Benson Electric Company will open at 1119 Tower avenue. Murray Calhoun, for several years connected with the official staff of the local exchange, will succeed Mr. Hallfrisch as manager.

Frank B. Shutts was elected president of the South Atlantic Telephone & Telegraph Company of Miami, Florida, to fill the vacancy caused by the death of Julius Smith, which occurred recently.

J. J. Milam, for ten years local manager for the Southern Bell Telephone & Telegraph Company's LaGrange branch, retired recently to the field of private business. He was succeeded by John L. Nelson, a former Troup county man, who has made a fine record with the company in Atlanta. Mr. Nelson went from Salem district, and his proven merit as a telephone man especially fits him to succeed Mr. Milam, under whose management the LaGrange branch has led all cities in the south in its general record and annual showings.

Aaron Smith, for several years editor of the *Transmitter* at Fort Worth, Texas, has disposed of the Smith Printing Company and will devote his time to another line of work. He will remain in Fort Worth and is contemplating issuing a magazine, the nature of which has not yet been announced.

C. C. Waggoner, former plant superintendent of the Southwestern Bell Telephone Company for Arkansas, died recently in Denver, Colo., where he had been for four months in search of health.

William D. Wood is the new manager of the Mountain States Telephone and Telegraph Company of Provo, Utah. Mr. Wood has been with the company for a number of years and will devote practically all of his time to this district. He states that on account of the war they have been unable to get new equipment, but he expects a new supply soon. He states, that on account of the growth of Provo two new sections of the switch board will be installed in the near future to take care of their growing business.

Guy Davis, who has been line manager for the Southwestern Bell Telephone Company at Larned, Kansas, has accepted a position as manager of the Burdett Telephone Company at Burdett, succeeding Tom Sidebottom, who has purchased the Belpre and Truesdale telephone exchange, and will move there to run them.

At a meeting of the heads of the departments of The Home Telephone & Telegraph Company of Fort Wayne, Ind., held recently, Frank E. Bohn, secretary and general manager of the company, announced that he had appointed O. Marahrens as assistant secretary. Mr. Marahrens has been with the company for the past sixteen years and has been acting in the capacity of auditor for the past five years. He will continue to discharge the duties of that office, but will assume the additional duties incident to the office of assistant secretary.

Upon the occasion of his sixty-fifth birthday, when he retired from the presidency of the Southern Group, after forty-six years spent in the service, W. T. Gentry was given a beautiful banquet at the Capital City Club, in Atlanta, at which about a hundred guests were present.

Philip K. Condict, who until recently has been in government service, has been elected vice-president of the International Western Electric Company, Incorporated. In 1917, Mr. Condict gave up his work as foreign sales manager for the company to take charge of the New York office of the War Trade Board, after a short stay with the Department of Commerce. In December, 1917, he received a commission as major in the Quartermasters' Corps, U. S. A., serving in that capacity until July, 1918. He was then detailed to the Signal Corps, with the same rank, and served in France until January. Mr. Condict has been with the Western Electric for sixteen years. Upon graduating from Yale, in 1903, he became a clerk in New York. In November, 1905, he was made chief clerk at Philadelphia. In 1907 he was sent to Japan and stationed in Tokyo as secretary of the Nippon Electric Company. May, of 1913, found him back in New York doing special work, while October of that year brought him the position of foreign sales manager.

Harry Fellison, who for twelve years has been office manager of the Bell Telephone Company in St. Joseph, Mo., has resigned that position, effective May 15. Mr. Fellison will engage in the general insurance business, with office in the Bartlett Trust building. Previous to entering the employment of the telephone company, Mr. Fellison was a member of the staff of the advertising department of *The News-Press*, and at one time was deputy city treasurer.

A. E. Huntly, for three and a half years manager of the Petoskey district of the Michigan State Telephone Company, has been promoted to the managership of the large Saginaw district, which includes the exchanges in that city, Bay City, Flint, Alma, Midland, and other cities of the Saginaw valley region.

Frank F. Fowle, until recently one of the receivers of the Central Union Telephone Company and formerly consulting engineer, and James R. Cravath, well-known consulting electrical and illuminating engineer of Chicago, have formed an engineering partnership under the firm name of Fowle and Cravath with offices in the Monadnock block, Chicago. Both partners are men who have made national reputations in their work and are especially well known in Chicago and the middle west. The services of the firm will be devoted to investigations, research, design, supervision, management, appraisals and rate cases, in the several fields with which the partners have heretofore been identified.

E. L. Gaines, one of the most widely known practical telephone men in the middle west, has been engaged to serve the Home Telephone Company, Ft. Wayne, Ind., in the capacity of traffic superintendent. Mr. Gaines' duties include the directing of the operating of all of the company's local and long distance lines.

NEWS FROM THE FIELD.

ARIZONA.

The Mountain States Telephone and Telegraph Company at Phoenix may charge its increased rates, against which the Arizona corporation commission has protested, until the supreme court of the United States has decided a similar protest now before it, Judge Lyman, in the superior court here, ruled recently.

ALABAMA.

The Greenville telephone exchange of Greenville wants to increase telephone rates. This petition was made recently before the public service commission. The rate of the proposed increase is as follows: Business telephones, from $2.50 to $3; private telephones from $1.50 to $2; rural $1 to $2.

Anniston has been added to the list of Alabama towns in which the Southern Bell Telephone Company wishes to raise rates. The number of communities now totals 61 listed for rate raising.

The change announced in telephone rates by Manager Fishburn, recently, will not take place in Gulfport, or anywhere in the entire state, the telephone company having been enjoined by the supreme court. Local officials say that there will be no increase over present rates until the case has been decided.

CALIFORNIA.

The Union Home Telephone and Telegraph, operating in Los Angeles and San Bernardino counties, reports to the railroad commission as follows:

Total assets, December 31	$3,539,258
Operating revenue	177,732
Operating expenses	128,506
Net operating revenue	$49,225
Nonoperating revenue	14,375
Gross corporate income	$ 63,691
Total deductions	83,196
Net corporate loss for year	19,594
Miscellaneous additions to income	49,827
Deficit on December 31, 1917	100,667
Deficit on December 31, 1918	70,435

The consensus of opinion among about 40 representative people of Orange county, including Anaheim, Fullerton, Orange, Placentia and Garden Grove, who met recently, was that the only available method that the said change of rate involves an increase in rent of $2.00 per annum.

The Automatic Home Telephone comrates the company would be forced into bankruptcy.

The public service commission recently of telephone relief is the establishment of a mutual system, to be outside the jurisdiction of the railroad commission. A resolution was unanimously adopted asking that telephone subscribers all over Orange county remove their phones at once and that every community of the county cooperate to the end that a mutual telephone system be installed.

FLORIDA.

United States Judge W. B. Sheppard issued an order recently restraining the Southern Bell Telephone Company at Nensacola from putting into effect the new rates made effective May 1, under the order of Postmaster General Burleson.

GEORGIA.

The annual meeting of the stockholders of the Consolidated Telephone and Telegraph Company was held at Thomasville recently and new officers were elected to serve for the coming year. Those elected were: President, W. A. Pringle, Thomasville; vice-president, R. L. Stewart, Atlanta; secretary and treasurer, W. H. Rockwell, Thomasville. The properties of this company are being operated by the government on a fixed annual rental, under the supervision of R. L. Stewart of Atlanta, who is Federal supervisor for the United States Telephone and Telegraph administration of the South Carolina and Georgia district.

Atlanta telephone operators at a meeting attended by about 100 of the girls recently, organized a union, affiliated with the Commercial Telegraphers' Union of America. The one other organization in this district, it is understood, is in Jacksonville.

ILLINOIS.

The Shumway Mutual Telephone Company of Shumway, Christian county, was issued a license to incorporate by Secretary of State Emmerson, with a capital stock of $2,500. The incorporators are: William G. Soltwedel, H. W. Stoldt and William J. Kyle.

A long drawn out disagreement between the Assumption Telephone Company and the Mutual Telephone Company of Assumption was settled by the state utilities commission recently when it decided that the Assumption Telephone Company must allow the other company the use of its lines to make long distance calls. Farmers are generally rejoicing at this decision as they formerly had to go to some nearby city to make a long distance call. Now they may call from their own Mutual phones.

The Cuba Central Telephone Company has filed with the state public utilities commission an application to increase rates.

A telephone cable to Chicago Heights has been installed at an expense of about $750,000 by the Chicago Telephone Company, and is now in operation, the final test having been made about April 1. The conduit runs south in Halsted street to Franklin station, the end of the street as now laid out. Thence a temporary cable detours through Homewood, reaching Chicago Heights via the Western avenue road. The company is considering other improvements in the Calumet region, but is somewhat undecided, being still under Federal control.

The Farmers' Fountain Telephone Company has filed with the Public Utilities Commission of Illinois schedules which will change the rates for rural party line service in the communities of Columbia, Waterloo, New Hanover and Valmeyer, in the counties of Monroe and St. Clair, and issued an order in which it rejected the new and increased telephone rates proposed pany has taken over the plant of the Central Union Telephone company at Pontiac and the systems will be combined.

Five hundred and fifty telephones have been moved from one location to another in the city of Decatur since Jan. 1, 1919. This is nearly as many changes as took place all during the year 1918. It is an indication of the large amount of moving which has been in progress. Not only were fewer people moving last year, but the telephone company was not doing as much work on account of lack of wire. More than 700 new phones have been installed since the first of the year. Some of these are phones which have been taken out of other places, leaving the net gain of entirely new subscribers more than 400. When the two telephone companies were consolidated, there were less than 8,000 phones in use. Now the total number in use in Decatur is 9,200. This figure, of course, includes the rural phones, of which there are about 450.

A certificate of dissolution of the Farmers' Mutual Telephone Company of Millstadt, was filed for record recently by Richard Rohr, the secretary.

The Farmers and Merchants Telephone company at Lovington is at work connecting up the underground cable started last year. After laying the cable west from the telephone office the paving engineer requested that they delay the work where it crossed the streets to be paved until after the grading had been completed. This delayed them several weeks and after putting in the cable conduit and concrete manholes, the Government issued an order compelling them to stop work. April 15th an order was issued from Washington which now permits them to go ahead and as fast as the work can be done and the wires connected, the overhead cable will be taken down and the poles removed. It is not claimed that this will improve the service, but it will at least prevent damage from lightning and sleet storms.

INDIANA.

The Twelve Mile Telephone Company at Logansport has petitioned the public service commission of the state for authority to increase its rates. The rate has been $1 a month for practically all kinds of service. The petition asks permission to charge a maximum of $2 per month.

The West Newton Telephone Company petitioned the public service commission for an increase in telephone rates. The company says that the present rate is $1.75 a month and asks that business telephones be increased to $2.40 and residence service to $2.

The Churubusco Telephone Company at Columbia City, through its president, Henry W. Soest, has asked for an increase in telephone rates. The application was addressed to the public service commission.

The People's Mutual Telephone company, which operates exchanges at Mentone, Burket, Big Foot and Silver Lake, has purchased the Claypool telephone system at Warsaw. The company now has about 1,500 subscribers.

The Central Union Telephone company incurred a deficit of $500,000 in Indiana last year, according to representations made to the state board of tax commissioners by W. H. Braddock of Chicago, tax agent for the company. He said that unless relief is granted in Indiana from the situation created by high taxes and low for thirty southern Indiana cities or towns by the Southern Telephone Company of Indiana.

Improved telephone service within three months in Mishawaka, is indicated by the new Central Union Telephone exchange at 116 East Third street. Two carloads of equipment have arrived, including five 15 position switchboards, permitting the use of 15 operators in addition to the chief operator. The Western Union Electric Co. has a force of workmen installing tile switchboards and other equipment. Under the combination of both systems the Central Union will have 1,000 patrons. Practically all the wires will enter the new exchange from underground conduits, doing away with unsightly overhead cables and wires. W. Dudding is the local manager.

IOWA.

Articles of incorporation for the Hickory Grove Road Rural Telephone Company at Davenport, were filed with the Scott county recorder recently by Ruymann & Ruymann, attorneys. The company has a capital stock of $10,000, and its officers are William Meyer, president; H. H. Horst, secretary, and Edward Meyer, treasurer. Other men interested in the company and who signed the articles are John Brandt, William Plambeck, Otto D. Arp, Bern Gasseling, Nels Steenholdt, Joe Guerink and August Schroeder.

The new State Telephone Company at Sioux City has sold out to the Iowa Telephone Company and a consolidation of the two city exchanges will be effected.

The Iowa Telephone Company at Des Moines, has appealed to the city for two years' extension of time in which to bring their electrical construction under the provisions of the city ordinances. Council recently granted one year's extension. The company pleads scarcity of labor and material due to the war. One year's extension was given in January, 1919.

The telephone systems at Walnut have been consolidated; the Farmers buying the Musson Bros.' system.

The Marcy Telephone Company of Ogden has taken over the Boone County Telephone Company plant.

The Co-operative Telephone Company has petitioned the council for a franchise and the right to establish an exchange at Boone.

Judge Earl Peters directed recently that each stockholder of the Independent Mutual Telephone Company of Shenandoah be paid the par value of his share of stock out of the funds which are on deposit in the First National bank of this city realized from the sale of all the stock to the Bell Telephmone Company more than two years ago. The matter of how to distribute the fund has been in litigation and a short time ago the Supreme Court of the state of Iowa rendered a decision confirming the holding of the lower court and now comes Judge Peters and orders the fund distributed accordingly.

Recently an important milestone was passed by the Fort Dodge Telephone Company when the local company recorded the installation of its 5,000th telephone instrument.

Receiver Levi Baker of the Mutual Telephone Company at Shenandoah, is distributing $84,000 to the stock holders. It has been held up by litigation for three years.

KANSAS.

A complete telephone system with small stations is being installed at Fort Riley and Camp Funston for the use of the guards.

That the monthly rental rate of the telephones in Salina will be increased, probably to an extent petitioned for before the public utilities commission, is expected by local telephone men. But they are not looking for the increase to come from the public utilities commission. It is expected the government will make the order. Such order is delayed now, it is believed, awaiting the outcome, of the suit by Kansas and South Dakota before the United States supreme court in which the Burleson rates are attached. It is pointed out that the settlement of the new England strike is an indication. The strikers got their wage increases. This means, it is claimed, a series of strikes over the country unless such wage increases are generally granted and to grant them means a hike in the telephone rental.

KENTUCKY.

Increased wages for the operators and wiremen of the Louisville Home and Telephone Company have been announced by P. S. Pogue, general manager of the company, following instructions received from Postmaster General Burleson at the same time instructions were received to increase the telephone rates. The increase for the operators will range between 15 and 35 per cent, and for the wire men the average increase will be about 25 per cent. In connection with the increased wages, it is announced that an eight-hour day will be inaugurated for the operators. The wire men are at present working on an eight-hour basis. The increase for the operators will make the range of wages from $8 to $14, instead of $6 to $12, and is effective as of May 1. This will meet in part the increased wages demanded by the operators and wire men who have voted to strike July 1 unless their demands are granted.

Increases in pay in departments other than those in which increases were recently announced were made public by the Frankfort Home Telephone and Telegraph Company. Under the new schedule, effective as of May 1, increases are made in the operating, plant and accounting departments and range from 15 to 35 per cent, an average increase of 27 per cent.

Barren County Home Company, Merry Oaks; capital $200; incorporators: William Neville, C. J. Wright and N. L. Pemberton.

Blue Level Telephone Company, Rockfield; capital $500; incorporators: W. T. Ellis, Martha A. Stone and J. W. Ellis.

Mayor Smith announced the city would resist Postmaster General Burleson's order increasing local rates for the Home Telephone Company at Louisville and that the right of the city to remove its poles and wires from the streets was being investigated.

Pine Grove Home Telephone Company, Pine Grove; capital $900; incorporators: Clayton Jones, Arthur Sumter and Johnie Reams.

Martin S. Taylor, general manager of the Fayette Home Telehone Company, recently stated that no increase in telephone rates in Lexington and Fayette county is contemplated by his company at this time. Mr. Taylor said that the Fayette Home Telephone Company raised its rates last August, when first apprised of the ruling of the Postmaster General, and that the proposed increase in rates at Louisville does not affect the home company.

The telephone company at Lancaster has announced to the city that it will suspend business just as early as it can be done legally, giving as its reason that the business is not profitable and that it has been losing money for many months past. The statement issued by the president says that "the annual loss to the company is very large and will eventually bankrupt not only the company but the owners of the stock who have constantly contributed from outside sources to the business."

New Stephensport Telephone Company, Stephensport, capital $500; incorporators: H. A. Dutschke, W. J. Schopp and E. A. Hardesty.

LOUISIANA.

The Cumberland Telephone Company has applied to the Louisiana Railroad Commission for permission to increase telephone rentals at all points in Louisiana except Shreveport and New Orleans. The proposed increases range from 9 to 25 per cent. New Orleans is eliminated because there was a rate readjustment there some few years ago. And failure to include Shreveport is due to a conviction on the part of the Cumberland company that it is morally bound by its contingent agreement not to raise rates here before June, 1923.

MARYLAND.

At a meeting of representative business men of Allegany county who oppose the extensive increases by the Chesapeake and Potomac Telephone Company the Allegany County Telephone Company with an authorized capital stock of $200,000, was formulated with the following incorporators: Olin R. Rice, Harry B. Colburn, Charles G. Watson, Mayor A. Charles Stewart, E. D. Hocking, W. A. Gunter and State Senator Geo. Louis Eppler. The new company will operate throughout Allegany county and all subscribers will be given an opportunity to become stockholders.

MICHIGAN.

According to announcement made by the Citizen's Telephone Company at Traverse City, 1,350 of 1,600 telephones have been put into commission again following the wrecking of the entire system by the storm in this section.

The Van Buren County Telephone Company, at its annual meeting at South Haven, elected the following officers and directors: Robert H. Adkin, president; Volney Ross, vice-president; Albert Chase, secretary and treasurer. Directors: Robert Adkin, T. A. Bixby, Thomas Cavanaugh, Mrs. Ellen Merkle, Volney Ross, Dr. O. M. Vaughn, Jr., Dr. G. F. Young.

City Attorney Taggart recently completed the answer to the petition of the Michigan State Telephone Company at Grand Rapids for an advance in rates, demanding that there be no increase unless there is a merger of the two companies as far as the city is concerned.

More than 50 local telephone operators have joined the ranks of organized labor at Kalamazoo. The new union will be affiliated with the International Brotherhood of Electrical Workers.

MINNESOTA.

The annual meeting of the Midland Telephone Company at Adrian was held recently for the election of directors and the transaction of other business matters connected with the company. C. M. Smallwood and Edwin Brickson were re-elected directors and Joseph Lais elected as third director filling the vacancy caused by the death of W. R. Mansel. These directors will meet in the near future for the election of president, secretary and treasurer of the company. The business of the Midland Telephone Company for the past year has been very satisfactory notwithstanding the advancing cost of labor and material.

The Rochester Telephone Company at Rochester is planning extensive improvements in the southwest section of the city. One of the new installations will be the laying of a large underground conduit in the alley between Fourth avenue and Fifth avenue, southwest, from Second to Sixth streets, southwest, to accommodate additional business created by the College apartments and new homes in the hill district. The city council recently granted the telephone company permission to lay such a conduit.

The many miles of telephone lines that were destroyed by the forest fires on October 12 will be rebuilt according to the decision of the farmers and business men of Moose Lake who met recently. Each member will be assessed $10 to defray the cost of rebuilding the lines. The work will be done under the direction of the Farmers' Telephone organization. Officers elected at the meeting follow: H. P. Madsen, president; William Anderson, vice-president; Eddie Peterson, secretary; Gust Olson, treasurer, and Charles Haney, director.

A new telephone exchange will be built at Wabasso during the present season. This was decided at a recent meeting of the directors of the Redwood County Rural Telephone Company. The contract was let for a building 22x24 feet, with full basement. It will cost $2,500.

The Balkan Township Farmers' Co-operative Association elected Frank G. Harris, former newspaperman, now bonanza farmer, president; W. E. Bates, secretary; Gust Lake, Palo Amistadt and John Laurich, directors. The association is composed of farmers living about six miles north of Chisholm. The members decided to build a branch telephone line to accommodate fifteen new subscribers this spring.

The Northwestern Telephone Exchange Company recently announced a wage increase amounting to $600,000 a year for its employees in Minnesota. The announcement was made in a telegram to local officials from W. B. T. Belt, vice-president and general manager.

Special telephones are to be installed on the trading floor of the Chamber of Commerce at Minneapolis to do away with messenger service as far as possible. The object is to give traders in the pit quick communication with their firms and customers. The trading floor is to be enlarged and its facilities improved.

MISSOURI.

At a mass meeting of citizens at Springfield, recently, cards were distributed pledging telephone subscribers to order their telephones taken out and the service discontinued until the restoration of rates that existed prior to the increase which went into effect May 1 on order of the postmaster general. The city attorney was instructed to represent Springfield in the injunction proceedings brought against the Missouri public service commission to restrain them from interfering in the rate increase.

Bell telephone subscribers at Trenton have decided to do without telephones in view of the increased rates. Nearly five hundred subscribers out of approximately seven hundred affected by the new rates have signed a remonstrance which calls for a discontinuance of use of telephones if the old rates are not adhered to.

Telephone rates in Fulton will not be increased for at least another six months,

according to an order received recently by City Attorney W. B. Whitlow, from the Public Service Commission at Jefferson City. The Missouri Central Telephone Company of Fulton applied to the commission sometime ago for an increase in rates, to become effective on January 1, 1919, and the matter was suspended by that body until May 1, 1919. The order that Attorney Whitlow received states that the commission will be unable to hear the case before May 1, which was the limit of the first suspension, and is compelled for that reason to extend the suspension another six months, or until October 31, 1919.

Reports received by the Public Service Commission are to the effect that Postmaster General Burleson shortly will order local telephone rates in Missouri increased. The commission plans to reject the schedules if they are filed and enjoin the companies from putting them into effect in the same manner that the long-distance rates were.

Kansas City will be saved from an increase of telephone rates by the provisions of the ordinance for the merger of the two telephone companies here. At the offices of the Bell Telephone Company, which will be merged with the Home company, it was stated that the new rate schedules which have been ordered in force by Postmaster General Burleson in Oklahoma, Kansas and Missouri will not affect Kansas City.

An increase of $2 a week in the pay of its older switchboard operators and $1 a week for those employed a shorter period recently was announced by the Southwestern Bell Telephone Co. at St. Louis. F. O. Hale, general manager of the company, said that the increase was made possible by increased revenue accruing to the company through an increase in charge for service recently announced in St. Louis. Hale said the company realized that increased costs of living were being felt by employes, as were increased costs of materials by the company.

NEBRASKA.

Wakefield new telephone system will be placed in use shortly and better service is promised.

The Lincoln Telephone Company will be required to rebate to its subscribers for exchange rental on phones which were out of commission because of the storm in April. The company will be allowed to have seven days' credit, but where phones were out of commission longer than that time the company must make good the loss to its phone subscribers. This is the order of the State Railway Commission.

Directors for the recently formed Fordyce Farmers Telephone Company were elected at the first meeting of the stockholders last Saturday afternoon. The directors chosen are J. M. Johnson, A. J. Thoene, John Tigges, Frank Lammers and Leo Schrempp. The directors organized by the selection of Dr. Johnson as president; John Tigges, vice-president and Frank Lammers as treasurer. The board will select a secretary at the next meeting. The capital stock of the company is $25,000, about one-third of which has already been sold. Many others who subscribed for shares have not had time to take them up since the permit to sell stock was received from the state railway commission.

The Steele City Telephone Company received a new switchboard recently. This one is much larger than the old one now in use and is equipped with all the latest devices for simplifying and making easier the duties of the operator.

The Lincoln Telephone & Telegraph Company at Lincoln has applied to the state railway commission for an order continuing for another six months the emergency rates that were put into effect for a period of six months on October 1 last. These affect sixty exchanges, including Lincoln. The rates were raised from 25 cents a month in some instances for residence service to 75 cents on business service on several exchanges. This was done to meet war conditions, the increased cost of material and supplies and higher wages. The company sets out that the prices of but few of the materials used in repairs and replacements has decreased, and that the tendency in labor costs is upward. It says that substantially the same reasons now exist for the higher rates as existed when the emergency order was granted. At that time none of the cities and towns affected were notified, as the commission took judicial notice of war emergency existing.

Sometime in the near future the telephone system in Fairbury will be operated under the new equipment, which includes a new building, cables laid in conduits in the business section and on poles in the residence section. This is said to be the best equipped telephone system there is anywhere, the most up to date in every particular. Application has been made to the Nebraska State Railway Commission for an increase of rates.

NEW MEXICO.

Intention of the New Mexico Corporation Commission to make a fight, either by injunction or mandamus, on the rate increases recently put into effect by the Mountain States Telephone and Telegraph Company, was announced by Hugh H. Williams, chairman of the commission, recently.

NEW YORK.

At annual meeting of New York Telephone Company directors were re-elected. At directors' organization meeting Waldron Hoppins was elected secretary and Walter Brown, who was secretary and treasurer, remains treasurer.

NORTH CAROLINA.

Plans for the improvement of the telephone system of Durham are under contemplation by the Inter-State Telephone and Telegraph Company in connection with the putting of its wires on Main street under ground, it was learned recently. The telephone office and central headquarters will be moved from their present location at the corner of Main and Church streets to the Wright building at the corner of Parrish and Mangum streets. The telephone company will have its offices on the first floor of the building while the second floor will be devoted principally to the central office and other departments of the company. Just when these changes will take effect has not been definitely decided upon. It was stated, however, that the underground work will be started in the immediate future. The question of whether the work will be done by the telephone company or let out on a contract has not as yet been decided.

OHIO.

The Ohio Public Service Commission recently granted the Montpelier telephone exchange a raise in rates which the local patrons did not feel warranted and the patrons have organized a boycott. They offer to make an investigation of the company's books and allow a rate which will grant the company a six per cent earning on its investment, but the company refuses to recognize any other rate making power than the Public Service Commission. Business men have put up signs in their stores saying that they are backing the people and have discontinued using telephones.

The Ada Telephone Exchange Company of Ada, Ohio, filed a petition for injunction restraining Walter Coppersmith and Earl Martz from stringing certain wires from Beaverdam to Lafayette. According to the petition the plaintiff states that Mr. Coppersmith and Mr. Martz intend stringing wires to carry 6600 volts of electricity from Beaverdam to Lafayette and that the poles upon which the wires will be hung are to be 25 feet high, which is the height of the poles belonging to the Ada company. This, the plaintiff claims, will result in damage to the operation of their lines, and asks that the two men be restrained from stringing the line.

Athens County Home Telephone Company, Athens; increase of capital stock $60,000 to $75,000 common, $90,000 to $150,000 preferred.

The Chesapeake & Potomac Telephone Company of West Virginia has agreed with City Solicitor C. L. Williams to postpone increase in telephone rates in Steubenville until the supreme court has handed down its decision as to the right of the company or Director Burleson to raise the rates. The city solicitor was prepared to bring injunction proceedings in the common pleas court to prevent the company from putting the new rates into effect, but withheld his petition after a conference with company officials. In case the supreme court upholds Director Burleson, the increase will be effective from May 1, when the new rates were to have become effective here.

New Stephensport Telephone Company, Stephensport; capital $500. Incorporators: H. A. Dutschke, W. J. Schoop and E. A. Hardesty.

The people of Highland county are hailing with delight the news of the consolidation of the two telephone systems of the county, and the establishment of new rates that will make county-wide service possible over one system. It is explained that the rates will be higher than over either of the former single lines, but much lower than have been paid where complete service was given by the use of both phones. Examination of the schedule of rates shows that the rental charges are higher than are paid by Clinton county patrons of the Clinton Telephone Co., which by common assent of telephone authorities is the best county system in Ohio.

At a meeting of the board of directors of the Berry County Telephone Company, at New Lexington, held recently, the old officers were unanimously re-elected, viz.: President, P. M. Cullinan; vice-president, C. T. Griffith; secretary-treasurer, T. M. Potter; general manager, George R. Smith; executive committee, John Amberge, John C. Druckemiller and J. W. Cherry.

Subscribers of the People's Telephone Company of Mt. Blanchard have formed a new telephone company as a means of

protest against a 50 per cent rate increase.

Application has been made before the Public Utilities Commission by the Lima Telephone & Telegraph Company for an increased rental of one dollar per month on business telephones.

The Millersburg, Wooster & Orrville Telephone Company has been authorized by the Public Utilities Commission to issue $105,700 worth of new capital stock in exchange for Liberty bonds of any issue, provided that neither stock nor bonds are taken at less than par. The company is not to dispose of the Liberty bonds at less than par or at a price approved by the commission. This is the first arrangement of the kind approved by the commission. Officers of the company said it needed funds, but could not sell any stock while investors could get hold of government war bonds, but said they knew of Liberty bond holders who would like to exchange the bonds for stock in the company.

If negotiations that are now under way go through, Middlefield will no longer suffer under the burden of two telephone systems. The arrangement that is planned at present is the purchase of the lines of the Burton Company by the Middlefield Mutual Telephone Association. If this could be accomplished, it would be of great advantage to both Middlefield and Burton and to surrounding towns, as well.

Prosecuting Attorney William T. Dixon recently filed a petition in Belmont county common pleas court asking an injunction to prevent the Chesapeake and Potomac Telephone Company from putting into effect a schedule that would increase charges in Shadyside, Bellaire, Bridgeport, Martins Ferry, Florence, Barton, Lansing, Wheeling Creek, Blaine, Maynard, St. Clairsville and Neffs, as well as reduce the service area of subscribers in each of these places.

In order to accommodate a large number of subscribers in the southeast section of Dayton, and especially in the village of Oakwood, the Central Union Telephone Company has begun the work of laying underground cables down Warren and Brown streets. Many new subscribers, unable to secure telephone service during the past year, because of war's building restrictions, will shortly enjoy having instruments in their homes, said General Manager H. E. Allen.

The ten thousandth telephone to be installed in Lima was connected up recently.

The Bell Telephone Company was restrained temporarily from increasing rates in Warren and between Warren and Niles by Common Pleas Judge C. M. Wilkins today after a suit had been filed by State Attorney General Price. The state asks that the injunction be made permanent. Under the new arrangement, announced by the telephone company rates in Warren were increased about 35 per cent and a 5-cent toll charge fixed between here and Niles. The state claimed the rates were fixed by the public utilities commission and could not be altered save by that body.

The Highland County Telephone Company was authorized by the Public Utilities Commission recently to purchase the Hillsboro Telephone Company and the Central Union Telephone Company of Hillsboro. The total price set is $151,650. The enlarged company also serves half a dozen villages around Hillsboro. A slight increase in rates was allowed.

Allen County Home Telephone Company, Scottsville; amended articles increasing capital from $7,500 to $20,000.

The Bellevue Home Telephone Company re-elected directors as follows at the annual stockholders' meeting: C. W. Bell, H. C. Stahl, John P. Ruffing, G. A. Wright, Frank A. Knapp, R. T. Wolfrom and Allan G. Aigler. The directors re-elected these officers: President and general manager, Frank A. Knapp; vice-president, Chas. W. Bell; secretary and treasurer, Ralph T. Wolfrom.

A meeting of stockholders of the Peoples Mutual Telephone Company was held at Arlington recently to protest against the advance of rates in the company's new schedule. Rev. Bailey of Arlington was chairman and H. J. Pugh, secretary.

The Putnam Telephone Company at Columbus Grove has obtained carload of poles and wire for extensive repairs on toll lines in county.

Bell telephone interests at Norwalk were absorbed by the local company.

The Bell Telephone Company's headquarters in Bellefontaine were dismantled recently. The company is discontinuing its exchange in this city.

OKLAHOMA.

Enterprise of Pittsburg county farmers was evidenced recently at the meeting of commissioners, when permission was granted W. J. Ramey, A. W. Wallace, A. D. Stout, J. R. Weldon and C. O. Doss to establish a rural telephone line for their own convenience south of McAlester. The line will begin at the south limits of the city at Second street and will extend four miles.

SOUTH DAKOTA.

Officers of the farmers' telephone company which recently was organized at Petrel, near Lemmon, have awarded the contract for stringing the wires and installing the telephones on the 72 miles of telephone to be installed by the company.

Articles of incorporation have been filed for the Jones County Farmers Mutual Telephone Company at Murdo; capital, $10,000. Incorporators, A. P. Whitney, Jay C. Babcock, L. D. Lyman.

Grand View Telephone Company, Jackson county, capital $1,000; incorporators, Ernest Schulz, Archie E. Denny, Herman Ronne, all of Phillip.

TEXAS.

The Dallas Telephone Company of Dallas filed an amendment to its charter recently in the state department, decreasing its capital stock from $5,000,000 to $2,500,000.

At a meeting of the board of directors of the Dallas Telephone company recently the following officers were elected: President, H. J. Pettingill; vice-president, A. B. Elias; treasurer, E. D. Nims; secretary, J. P. Crowley; vice-presidents, J. E. Farnsworth and J. C. Casler; assistant treasurer, R. A. Nickerson; assistant secretary, W. R. Faught; general manager, Edwin F. Carter; general auditor, James K. Wass. Royal A. Ferris retires as president of the Dallas Telephone company and becomes chairman of the executive committee, the other members of which are Edgar L. Flippen, Edwin F. Carter and H. J. Pettingill.

A committee was appointed recently by the Dallas Dry Goods Merchants' Association to investigate the relative merits of the manual and automatic telephones. They will be assisted by an epert detailed by the Dallas Telephone Company.

The Sacul Telephone Company, Sacul, Texas, of which William Dewberry is owner, has recently made an addition to its switchboard.

The Telephone exchange at Covington, Texas, has changed hands, J. L. Burke being the new owner.

WISCONSIN.

The Door County Telephone company has commenced work of putting in a telephone line from Bailey's Harbor to North Bay. At the present time they are busy erecting poes, Ed. Cordier doing the work. This is the third new line established within the course of a few months. Several new phones have also been installed in private residences here. In spite of the rates being somewhat higher, phones seem to be in good demand. R. Eatough, manager of the company, of Sturgeon Bay, spent the week-end here, helping with the construction of the new line.

The merging of the telephone systems of Ashland has received the endorsement of the city council, a formal vote to that effect having been taken recently. The Home Telephone company was reorganized a few weeks ago, and it is considered that the time is ripe now for its consolidation with the Bell company, one of them perhaps handling the local business, and the other the long distance.

Fennimore Mutual Telephone company, Fennimore, dissolved, and Fennimore Telephone company, incorporated; capital, $25,000. Incorporators William Frankenoff, Boscobel; Edward F. Kreul and Anton Eisele, Fennimore.

The Wood County Telephone company appealed to the railroad commission for permission to raise Grand Rapids rates. According to the company officials the rates must go up or the company quit. The commission granted permission to charge 5 cents toll on a rural line to Rudolph, eight miles north, and has taken the question of raising local rates under advisement.

The County Line Telephone company is the name of a new rural telephone company just organized at Merrill. At least forty new rural phones will be installed as soon as equipment arrives.

The proposition to change the Fennimore Mutual Telephone company at Fennimore from a mutual concern to a stock company was carried at the special meeting held recently. Two hundred and forty-nine votes were cast for making the change and 40 against. This number was more than the necessary two-thirds majority required of the 372 share holders.

The Clintonville Telephone company has added much to its equipment for the betterment of the service to the patrons. All individual batteries have been eliminated, the entire exchange being controlled by one storage battery, which is far superior to the dry cell arrangement, and takes considerable less room. Five new transformers have also been added, making the exchange so it is now able to handle all calls more quickly and give better service in every way. The company now has about 700 subscribers in Clintonville.